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**COMPETITION FOR FEDERAL TIMBER
IN THE PACIFIC NORTHWEST -
an analysis of Forest Service and
Bureau of Land Management
timber sales**

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PACIFIC NORTHWEST
FOREST AND RANGE EXPERIMENT STATION
U. S. DEPT. OF AGRICULTURE - PORTLAND, OREGON
U. S. D. A. FOREST SERVICE RESEARCH PAPER PNW - 64 1968

3X **Competition for Federal Timber in the
Pacific Northwest**

**An Analysis of Forest Service and
Bureau of Land Management Timber Sales**

by

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1968

7 (U.S.) PACIFIC NORTHWEST
FOREST AND RANGE EXPERIMENT STATION

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U. S. DEPARTMENT OF AGRICULTURE
FOREST SERVICE

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INTRODUCTION

Objectives

The primary purpose of this paper is to identify differences in competitive behavior in the market for National Forest and Bureau of Land Management timber and to explain the influence of a specified set of market characteristics on these differences. Economic theory would lead one to expect that the degree of competition for timber will vary positively with the number of competitors, inversely with barriers to entry, and that large firms will achieve a significant degree of market power in the timber market.

Examination of sale data will indicate the degree of competition for Federal timber in the Douglas-fir (west side) and pine (east side) regions of the Pacific Northwest. Attention will be focused on a dichotomy between competitive and noncompetitive sales based on the premium paid on these two classes of timber sales.

An analysis of the extent of competition by small geographical areas (working circles on National Forests and master units on Bureau of Land Management lands) will be made to identify any geographical differentials in the degree of competition. Individual timber sales made by the two agencies will also be examined to determine factors which affect competition. Multiple regression analysis will be used in an attempt to determine the mathematical relationship between the degree of competition for timber as the dependent variable and the following independent variables: (1) number of bidders, (2) road construction cost, (3) sale size, (4) time, (5) bidder group (large or small firm), (6) appraised price of timber, (7) the price index for lumber, (8) sale type (whether oral auction or sealed bid), and (9) housing starts.

Finally, the objectives of the timber sales programs of the two agencies will be reexamined in view of the findings, and recommendations will be given.

Scope of the Analysis

Analysis is limited to the Pacific Northwest (Oregon and Washington); more precisely, to Region 6 of the National Forest System and to Bureau of Land Management lands in the State of Oregon. Within the Pacific Northwest, the west side and the east side will be treated separately. The west side is defined as the 19 counties of western Oregon and the 19 counties of western Washington lying west of the summit of the Cascade Range. The east side is the eastern portion, approximately two-thirds by geographical area, of each of the two States, but not including the Colville and Kaniksu National Forests in northeast Washington, which are part of Region 1. The Bureau of Land Management analysis will include only the State of Oregon.

Complete data on National Forest timber sales are available beginning with 1959, and Bureau of Land Management timber sale data are available over a longer period beginning with 1951. The hurricane that struck the Pacific Northwest on Columbus Day 1962 led to some changes in the 1963 timber sales patterns and may have disrupted the basic economic relationships that we wish to identify. Our analysis, therefore, ends with 1962 data.

Method of Analysis

The study is based on the record of timber sales as published.^{1 2} All timber sales have been punched on cards and processed through computers in order to allow a number of different

¹ U. S. Forest Service, Region 6. National Forest advertised timber sales. (Quarterly.) Portland, Oreg.

² Bureau of Land Management, U. S. Department of the Interior. Results of timber sales. (Quarterly.) Portland, Oreg.

classifications, tabulations, and analyses. Study of the published record was supplemented by about 140 informal discussions with persons directly involved in the process of bidding for Federal timber. About three-fourths of the interviews were with buyers of Federal timber, principally on the west side. The remaining one-fourth were with timber sale administrators.

With sales recorded on IBM cards, they may be classified in several ways. Classified by geographical area (by working circle for Forest Service sales and by master unit for Bureau of Land Management sales), sale characteristics may be identified by sale groupings somewhat more homogeneous than can be expected on a subregion basis. Further, the tools of stepwise multiple regression may be employed to identify the variables (sale characteristics) which are important in explaining competitive differences among the several geographical areas. The analysis can also be extended to an examination of individual sales. Again by means of stepwise multiple regression, the relationship between a number of independent variables and an index of the intensity of competition may be estimated.

Definition of Terms

In this study, the bid-appraisal ratio, in conjunction with the number of bidders per sale, will be used to establish the competitiveness of timber sales. These two measures are used in combination to establish three classes of competition for oral-auction sales, two noncompetitive and one competitive. The bid-appraisal ratio and classes of competition are defined below.

Bid-Appraisal Ratio

This is the ratio of the weighted average bid price for the timber in a given sale to the weighted average appraised price for the same timber. Since timber may not legally be sold for less than the appraised price, the minimum ratio is 1.00. The bid-appraisal ratio is used in this study as a measure of competition. The appraised and/or bid price per unit of volume in dollars cannot be used because these differ from sale to sale due to timber quality, accessibility, road construction cost which the bidder must

bear, distance to market, and other factors not related to competition. The ratio between the appraised and bid price is comparable between sales since appraisal methods are uniform for each agency within a subregion and the appraised price varies only because of the above-mentioned factors. Having defined the bid-appraisal ratio, we will now define the three classes of sale competition.

Noncompetitive Sales

ONE-BIDDER SALES.—The selling procedure adopted by the two agencies for oral-auction sales requires that any person intending to bid for a given timber sale first become qualified as a bidder. The requirement of qualification for Forest Service sales is that a sealed bid be submitted in advance of the sale at not less than the appraised price³ of the timber. For Bureau of Land Management sales, persons intending to bid orally must submit a bid deposit of 10 percent of the appraised price at the time of the sale. Since a qualifying bid cannot be submitted after the sale commences, those who fail to submit this bid are excluded from the oral auction. In most instances, qualifying bids for Forest Service sales are submitted at the appraised price for each species of timber. Where only one bidder submits a qualifying bid (and where such bidder is otherwise legally qualified), the offering is awarded to the one bidder at his bid price, normally the appraised price. In the case of Bureau of Land Management sales, the bid deposit does not obligate the bidder to take the sale. In this report, number of bidders for Bureau of Land Management sales refers to number of firms qualified to bid on a sale whether or not they made oral bids at the time the timber was sold.

TOKEN-BID SALES.—This second class of non-competitive sale is defined as a sale having two or more bidders qualified to make oral bids, but where evidence of serious bidding is lacking. Serious bidding is defined as a ratio of bid price to appraised price equal to or greater than 1.01.

³ Appraised price is defined by the Forest Service as synonymous with "market value" and "fair market value" as follows: " . . . the price acceptable to a willing buyer and seller, both with knowledge of the relevant facts and not under pressure or compulsion to deal. This price is sometimes called 'fair market value.' " Further, " . . . National Forest timber may be sold at not less than the appraised value." Determination of the appraised value is based on the residual value theory, that " . . . timber is worth the selling value of the products manufactured from it, minus cost of production and margin for profit and risk to the purchaser." (Forest Service Manual, 2423.12 and 2423.22.)

Where two or more bidders are qualified by identical bid prices (equal to appraised price), the tie bids must be broken by oral-auction bidding. If the qualified bidders, for a variety of possible reasons, do not wish to compete against each other by successive oral-auction bidding, the tie is frequently resolved by one such qualified bidder casting a minimum bid (normally 5 cents) above appraised price on the species of minimum quantity.⁴ Other qualified bidders often remain silent, and in due time the sale is awarded to the high bidder on the basis of a token bid above appraised price. Token bids are seldom found on Bureau of Land Management sales. Since each qualifying BLM bid is made orally and posted at sale time, a prospective bidder knows which other firms are interested enough in the sale to qualify and can decide at that time whether he wants to compete with them for the sale. In contrast, Forest Service procedures require that sealed qualifying bids be submitted. Therefore, the qualifying bids must be submitted without knowing the identity of other bidders. The token-bid sale by its nature suggests a degree of understanding among bidders. In the absence of significant competitive bidding, notwithstanding the presence of two or more qualified bidders, the token-bid sales are here classified among the noncompetitive sales.

Competitive Sales

The competitive sales are defined as all sales other than the two noncompetitive classes listed above. This class would, therefore, consist of sales having two or more bidders who engage in serious bidding, wherein evidence of serious bidding is found in a bid-appraisal ratio equal to or greater than 1.01.

Special Circumstances of the Shelton Working Circle

The National Forest timber sales data, analyzed throughout this study, exclude sales in the Shelton Working Circle of the Olympic National Forest which were made exclusively to the Simpson Timber Co. During the period covered by this analysis, National Forest timber in the Shelton Working Circle was combined with timber under the private ownership of the Simpson Timber Co. and dedicated to restricted use under a cooperative sustained-yield agreement. Under the terms of the agreement, the Forest Service is obligated to sell National Forest timber within the sustained-yield unit to Simpson Timber Co. at appraised prices. Standard and current appraisal procedures are used in establishing the appraised price. Bidding by firms other than Simpson Timber Co. is precluded. The agreement has been in effect since January 1, 1947. During the 4-year period under study, the Simpson Co. acquired 189,260,000 board feet of timber by oral auction at appraised price in the Shelton Working Circle.⁵

⁴ A given timber sale normally will consist of several different species. Each species may have a different value — the appraised value per thousand board feet. Bidding is by species. Thus, if Douglas-fir is appraised at \$12 per thousand board feet, a 5-cent increase would take the form of a \$12.05 bid on the Douglas-fir, leaving the bid price unchanged on other species. Since the total bid value of timber for any one sale is calculated by multiplying the bid price by the volume by species and summing, total value can be minimized on the token-bid sales by casting the token bid on the species having the least volume.

⁵ For an analysis and appraisal of the performance record under the Shelton cooperative agreement, see: Mason, David T., and Henze, Karl D. The Shelton sustained yield unit. J. Forest. 57: 163-168. 1959.

CHARACTERISTICS OF ORAL-AUCTION SALES

Having before us the definitions of noncompetitive sales, consisting of one-bidder sales, and two-or-more-bidder sales, where there is no significant bidding, and competitive sales, we may now proceed with an analysis of the bidding record. Basic information is supplied in tables 1 and 2 for both the west side and east side of the Pacific Northwest.

Number of Competitive and Noncompetitive Sales

West Side

FOREST SERVICE SALES.—For the west side, excluding the Shelton Working Circle, the 4-year Forest Service sale analysis covers 2,340 oral-auction sales. Of this total, 17.6 percent were noncompetitive by reason of only one bidder. In ad-

dition, 14.5 percent were in the noncompetitive token-bidding group. In total, 32.1 percent or about one out of three oral-auction sales fell within the noncompetitive classification. The remaining 1,588 sales, two-thirds of the total, were classified as competitive and had a ratio of bid price to appraised value equal to or greater than 1.01.

Because average sale size differed widely among the three competitive classifications, the percent of volume competitive and noncompetitive differed somewhat from the percent of number of sales measure. Table 1 shows that only 10.3 percent of the volume was transacted as one-bidder sales. However, 17.0 percent of the volume was sold under token-bidding conditions, somewhat more than by the percent of sales measure. In total, 27.3 percent of volume was sold without meaningful competition. Correspondingly, 72.7 percent of all volume sold was classified as competitive.

Table 1.—Characteristics of competitive and noncompetitive Forest Service oral-auction timber sales, 1959-62

Region and kind of sale	Number of sales	Percent of total sales	Total sale volume	Percent of total sale volume	Average bid-appraisal ratio	Average number of bidders per sale	Average volume per sale	Percent of each class of sales requiring road construction	Average road construction cost for sales requiring road construction
			M. bd. ft.				M. bd. ft.		Dollars
West side: ¹									
Noncompetitive:									
One-bidder	412	17.6	1,171,956	10.3	1.00	1.00	2,852	59.9	41,077
Token-bid	340	14.5	1,936,586	17.0	1.00	3.06	5,746	75.4	69,545
Total noncompetitive	752	32.1	3,108,542	27.3	1.00	--	--	--	--
Competitive	1,588	67.9	8,273,407	72.7	1.63	5.28	5,206	71.8	59,941
Total sales, west side	2,340	100.0	11,381,949	100.0	1.46	4.20	4,872	70.2	58,625
East side:									
Noncompetitive:									
One-bidder	223	37.5	1,316,880	34.9	1.00	1.00	5,932	76.7	45,146
Token-bid	117	19.7	1,182,294	31.3	1.00	2.46	9,832	89.7	71,965
Total noncompetitive	340	57.2	2,499,174	66.2	1.00	--	--	--	--
Competitive	255	42.8	1,276,410	33.8	1.60	3.56	5,017	80.0	30,447
Total sales, east side	595	100.0	3,775,584	100.0	1.20	2.39	6,307	80.7	44,766

¹ Sales to Simpson Timber Co. in the Shelton Working Circle of the Olympic National Forest are excluded from the west-side data. These sales are covered by a cooperative sustained-yield agreement and are transacted at appraised price.

Table 2.—Characteristics of competitive and noncompetitive Bureau of Land Management oral-auction timber sales, 1951-62¹

Region and kind of sale	Number of sales	Percent of total sales	Total sale volume	Percent of total sale volume	Average bid-appraisal ratio	Average number of bidders per sale	Average volume per sale
			M bd. ft.				M bd. ft.
West side:							
Noncompetitive:							
One-bidder	899	29.9	2,271,307	29.9	1.00	1.00	2,526
Token-bid	16	0.5	37,951	0.5	1.00	1.88	2,372
Total noncompetitive	915	30.4	2,309,258	30.4	1.00	1.02	2,524
Competitive	2,095	69.6	5,296,073	69.6	1.47	2.95	2,528
Total sales, west side	3,010	100.0	7,605,331	100.0	1.33	2.36	2,527
East side:							
Noncompetitive:							
One-bidder	91	61.1	99,636	58.8	1.00	1.00	1,095
Token-bid	2	1.3	2,122	1.3	1.00	2.00	1,061
Total noncompetitive	93	62.4	101,758	60.1	1.00	1.02	1,094
Competitive	56	37.6	67,692	39.9	1.37	2.50	1,209
Total sales, east side	149	100.0	169,450	100.0	1.16	1.58	1,137

¹ Data not available for percent of, and average road construction cost for, sales requiring road construction.

BUREAU OF LAND MANAGEMENT SALES.—The Bureau of Land Management analysis for the west side includes 3,010 sales made over the 12-year, 1951-62, period (table 2). Of these, 915 or 30.4 percent were noncompetitive, 29.9 percent in the one-bidder group and 0.5 percent in the token-bid group. Sales classed as competitive numbered 2,095 and made up 69.6 percent of the total.

Average sale size did not differ greatly among the three competitive classifications. The percent of total volume sold under each of the competitive conditions was identical to the percent of sales measure.

The larger percentage of one-bidder sales and very few token-bid sales would be expected since Bureau of Land Management sale procedures do not require qualifying sealed bids as do Forest Service sales. The overall noncompetitive-competitive breakdown was about the same on both ownerships, with about two-thirds of all sales sold competitively and one-third sold at approximately the appraised value.

East Side

FOREST SERVICE SALES.—Only 595 Forest Service sales were made on the east side during the 1959-62 period — one-fourth as many as on the west side — but a larger proportion of these sales was in the noncompetitive group. The one-bidder sales on the east side accounted for 37.5 percent of all sales and the token-bid sales, an additional 19.7 percent. In total, 57.2 percent of all sales were noncompetitive. Only 42.8 percent, or 255 sales, were sold competitively in the region.

The volume proportions show 34.9 percent of the total east-side volume in the one-bidder group. This proportion was about 3½ times the percentage found for the west side. The token bid sales accounted for 31.3 percent of total volume sold on the east side and the proportion was nearly twice that of the west side. Total noncompetitive volume on the east side represented nearly two-thirds of all volume sold, 66.2 percent, well over twice the proportion of noncompetitive sale volume found on the west side. Only 33.8 percent of the volume was sold competitively.

BUREAU OF LAND MANAGEMENT SALES.—Very few east-side sales were made by the Bureau of Land Management; the 1951-62 total was only 149. As was the case with Forest Service sales in the two regions, a much larger proportion of Bureau of Land Management east-side sales were noncompetitive. One-bidder sales made up 61.1 percent of the total number of sales and token-bid sales, 1.3 percent. Fifty-six competitive sales were made, accounting for 37.6 percent of the total number.

The volume sold under the various competitive conditions on the east side followed the pattern found on the west side; that is, the proportion of total volume and the proportion of total sales in each of the competitive classifications were about the same.

Bid-Appraisal Ratios

West Side

FOREST SERVICE SALES.—Although bidding at oral auction during the periods examined produced a 46-percent premium over appraised value for Forest Service sales, a sharp distinction existed between the competitive and noncompetitive components of all oral-auction sales. For the volume sold under noncompetitive conditions, there was, by definition, no premium over appraised price. The average ratio of bid price to appraised value was 1.00.

In sharp contrast, the 72.7 percent of all Forest Service volume sold under competitive conditions carried an average premium of 63 percent over appraised price.⁶

BUREAU OF LAND MANAGEMENT SALES.—Bidding on Bureau of Land Management oral-auction sales over the 1951-62 period resulted in an average premium over appraised price of 33 percent. When only the 69.6 percent of the total BLM sales volume sold competitively was considered — noncompetitive sales had a bid-appraisal ratio of 1.00 — the bid premium amounted to 47

percent, somewhat lower than that found for Forest Service sales but well above the appraised level.⁷

Figures 1 and 2 show bid-appraisal ratios for west-side Forest Service and Bureau of Land Management sales from 1951-66. The year-to-year movements in the bid-appraisal ratio indicate a cyclical type of behavior which closely follows cycles in residential construction.⁸

East Side

FOREST SERVICE SALES.—The difference between premium prices paid for competitive and noncompetitive sales was also found on the east side. Competitive Forest Service sales carried a 60-percent average premium over appraised price, only slightly less than the west-side experience. However, the high premium for competitive sales applied to only 33.8 percent of the east-side volume compared with 72.7 percent for the west side.⁹

BUREAU OF LAND MANAGEMENT SALES.—The Bureau of Land Management east-side competitive premium was 37 percent. As was the case when Forest Service sales in the two regions were compared, this premium applied to a much smaller proportion of the total volume sold, 39.9 percent, as compared with 69.6 percent on the west side.¹⁰

Average Number of Bidders

There is no readily available measure of the number of active and potential competitors for Federal timber in a given geographical area. We may, however, use the recorded data on number of qualified bidders (see pages 4 and 5) per sale as an indicator of the number of active bidders.

⁷ In the 1964-66 period, this premium increased to 75 percent.

⁸ For an elaboration of the relationship between residential construction and cyclical behavior in the lumber industry, see: Mead, Walter J. Character of residential construction and its impact on lumber production and prices. West. Econ. Ass. Proc. 1961: 32-39.

⁹ In the 1964-66 period, the premium bid over the appraised price increased slightly to 63 percent.

¹⁰ In the 1964-66 record, the premium declined to 19 percent. The reader is reminded that the volumes involved in BLM east-side sales were relatively small.

⁶ A separate analysis of the 1964-66 sales record shows that the average premium paid in competitive sale has increased sharply to 100 percent over the appraised price.

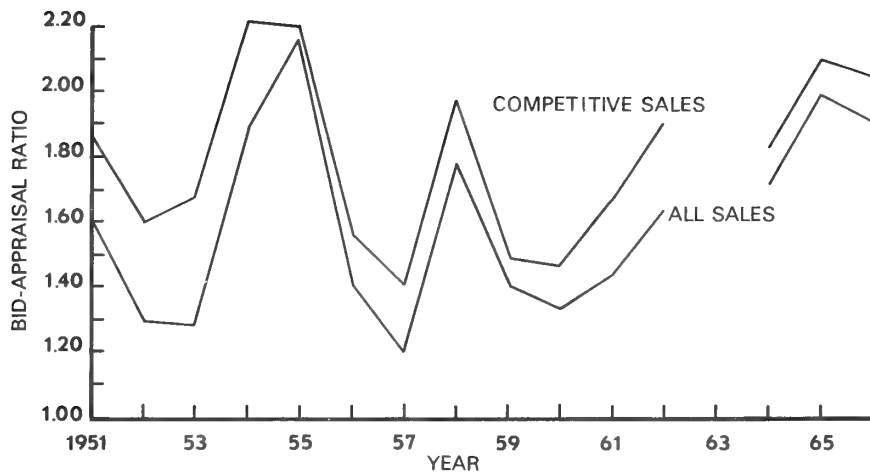


Figure 1.—Bid-appraisal ratio for oral-auction timber sales and for competitive sales only, Forest Service west-side sales, 1951-66.

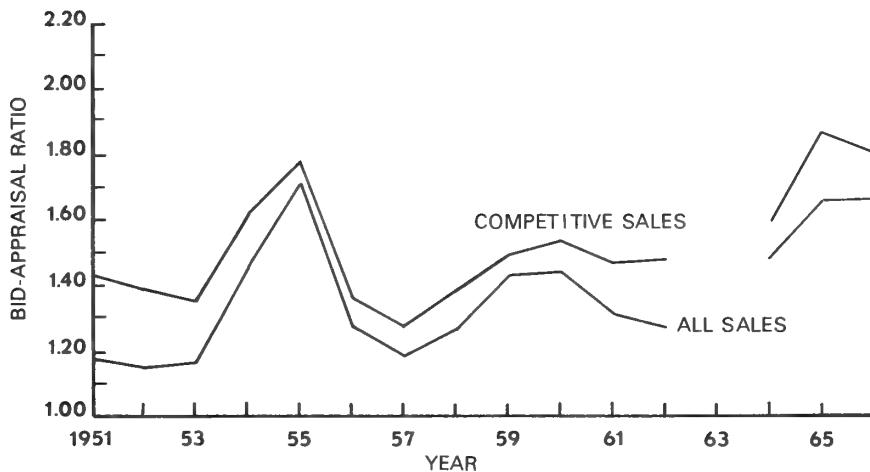


Figure 2.—Bid-appraisal ratio for oral-auction timber sales and for competitive sales only, Bureau of Land Management west-side sales, 1951-66.

Presumably, the areas having many active and potential bidders will also show a relatively large number of qualified bidders. Conversely, in areas where bidders are few, the number of bidders becoming qualified to bid on individual sales will be small. A smaller number of qualified bidders per sale would be expected on Bureau of Land Management sales since it is not necessary to qualify for these sales prior to the actual time of sale.

West Side

FOREST SERVICE SALES.—The average number of qualified bidders per sale on the west side differed among the two sales classes which have more than one bidder. Forest Service sales in the noncompetitive group — token-bid sales — had an average number of bidders per sale of 3.06. In contrast, the competitive sales had an average of 5.28 bidders.

BUREAU OF LAND MANAGEMENT SALES.—

Bureau of Land Management sales averaged fewer bidders than did those made by the Forest Service but had the same relationship between classes of sales. Sales in the token-bid class averaged 1.88 bidders per sale, and competitive sales had an average of 2.95 bidders per sale.

East Side

FOREST SERVICE SALES.—On the east side, where a higher proportion of noncompetitive sales was found, there was evidence of fewer competitors. Forest Service token-bid sales averaged 2.46 bidders per sale, and competitive sales averaged 3.56 bidders. Both sales classes had a lesser number of competitors than was found on the west side.

BUREAU OF LAND MANAGEMENT SALES.—

Only two Bureau of Land Management sales were purchased with token bids on the east side; two firms qualified to bid on each of these sales. Competitive sales averaged 2.50 bidders, again indicating less competition than was found on the west side.

There appears to be a positive relationship between the two sale characteristics we have just discussed: bid-appraisal ratio and average number of bidders (figs. 3 and 4). All noncompetitive single-bidder and token-bid sales are included in the 1.00 bid-appraisal class. For both ownerships and for both the west and east side, there is an increasing trend in the number of qualified bidders for competitive sales associated with larger bid-appraisal ratios.

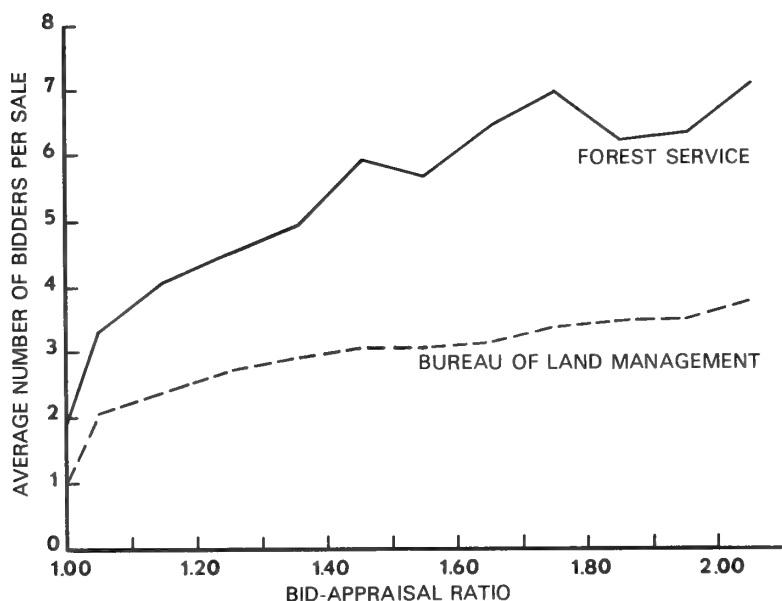


Figure 3.—Average number of bidders per sale by bid-appraisal ratio classes, Forest Service 1959-62) and Bureau of Land Management (1951-62) oral-auction sales only, west side (see tables 17, p. 48, and 27, p. 57).

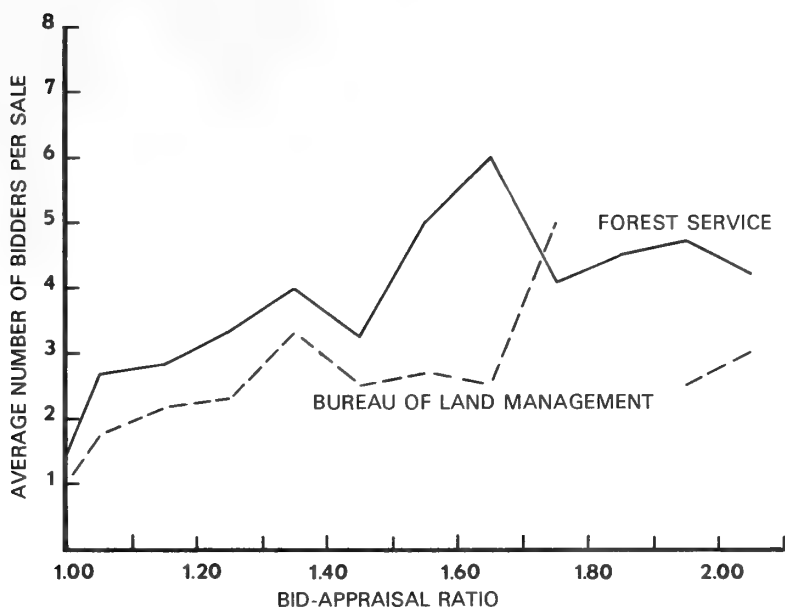


Figure 4.—Average number of bidders per sale by bid-appraisal ratio classes, Forest Service (1959-62) and Bureau of Land Management (1951-62) oral-auction sales only, east side (see tables 18, p. 48, and 28, p. 58).

Sale Size and Road Construction Cost

West Side

FOREST SERVICE SALES.—One-bidder Forest Service sales were smaller on the average than the other two groupings. Mean volume per sale for the one-bidder group amounted to 2,852,000 board feet, compared with 5,746,000 board feet for the token-bid group and 5,206,000 board feet for all competitive sales. Differences also existed in the percent of sales requiring road construction and the average road construction cost for those sales requiring construction. Only 59.9 percent of the one-bidder sales required road construction compared to 75.4 percent for the token-bid group, and 71.8 percent for the competitive sales. Sales characterized by token bidding had a high average volume per sale, a high proportion of such sales

required road construction, and the average road construction cost per sale was highest of the three sales classes. On the other hand, the one-bidder class had the lowest volume per sale, the least proportion of sales requiring road construction, and the lowest average road construction cost when road construction was required.

There appears to be a positive relation between the average bid-appraisal ratio and volume size classes (fig. 5). The lowest premiums shown are for the smallest size class, sales of less than 1 million board feet. The average premium increases steadily to a relatively large class, 10 to 14.9 million board feet, and then declines for sales of 15 million board feet and larger.

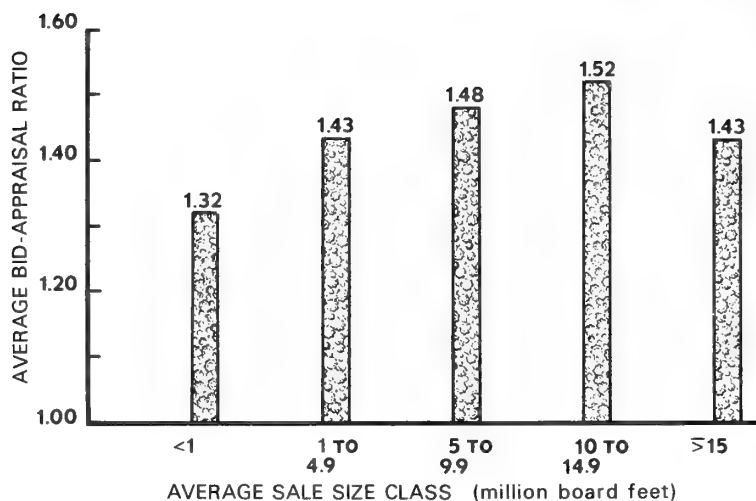


Figure 5.—Average bid-appraisal ratio by sale size classes for all Forest Service oral-auction timber sales, west side, 1959-62.

BUREAU OF LAND MANAGEMENT SALES.—

Bureau of Land Management sales on the west side did not show the same relation between sale size and competitive class as Forest Service sales. One-bidder sales and competitive sales had practically the same average sale volume; and token-bid sales, which accounted for only 0.5 percent of the total, had only a slightly lower average volume. (Road construction cost information was unavailable for Bureau of Land Management sales.)

The relation between sale size and the bid-appraisal ratio also differs from Forest Service sales (fig. 6). For west-side Bureau of Land Management sales the relationship is negative with the higher premium found in the smallest sale size class and the lowest premium found for sales of over 15 million board feet. Most BLM sales fall into the first three size classes; the ratio shows only a slight decline for these sales.

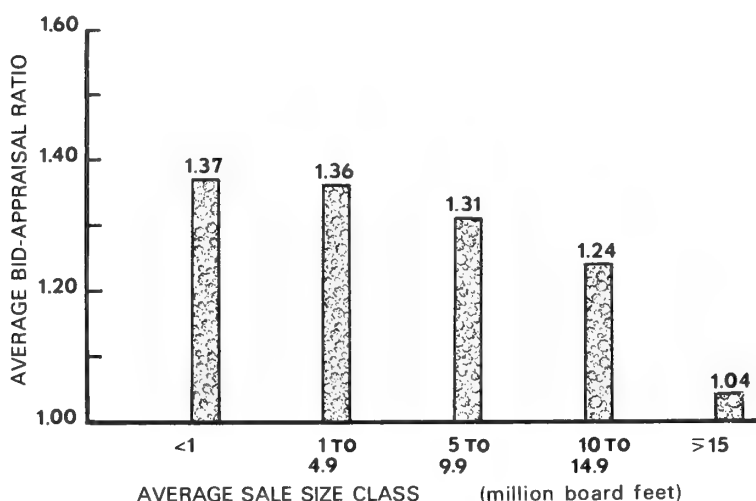


Figure 6.—Average bid-appraisal ratio by sale size classes for all Bureau of Land Management oral-auction timber sales, west side, 1951-62.

East Side

FOREST SERVICE SALES.—East-side Forest Service sales also showed average volume differences by competitive class, but the pattern was not the same as that found on the west side. The smallest sale size for the east side was found in the competitive group rather than in the one-bidder non-competitive class. The one-bidder sales averaged 5,932,000 board feet, approximately twice the average size of the west-side one-bidder sales. The east-side token-bid sales were also relatively large at 9,832,000 board feet. But competitive sales on the east side averaged 5,017,000 board feet per sale, slightly smaller than their counterparts on the west side. The percent of sales requiring road construction on the east side was slightly higher than for comparable groups on the west side. Like west-side sales, a higher proportion of the token-bid sales required road construction.

The relation between sale size and the bid-appraisal ratio for east-side Forest Service sales is similar to that found for west-side BLM sales (fig. 7). The premium increases from the smallest sale size to the second class, but declines throughout the next three classes.

BUREAU OF LAND MANAGEMENT SALES.—Bureau of Land Management average sale volumes showed a competitive class pattern similar to that found on the west side; however, sale volumes were smaller. Again, the few token-bid sales had a slightly smaller average volume than the one-bidder and competitive sales, and the latter two classes had about the same average size.

No sales were made in the two largest sale size classes and only one sale was made in the 5- to 9.9-million-board-foot class. The two smaller size classes had relatively low premiums (fig. 8).

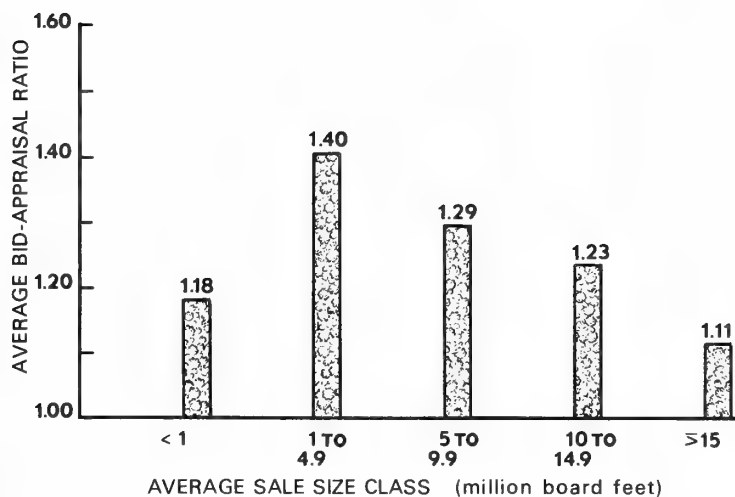


Figure 7.—Average bid-appraisal ratio by sale size classes for all Forest Service oral-auction timber sales, east side, 1959-62.

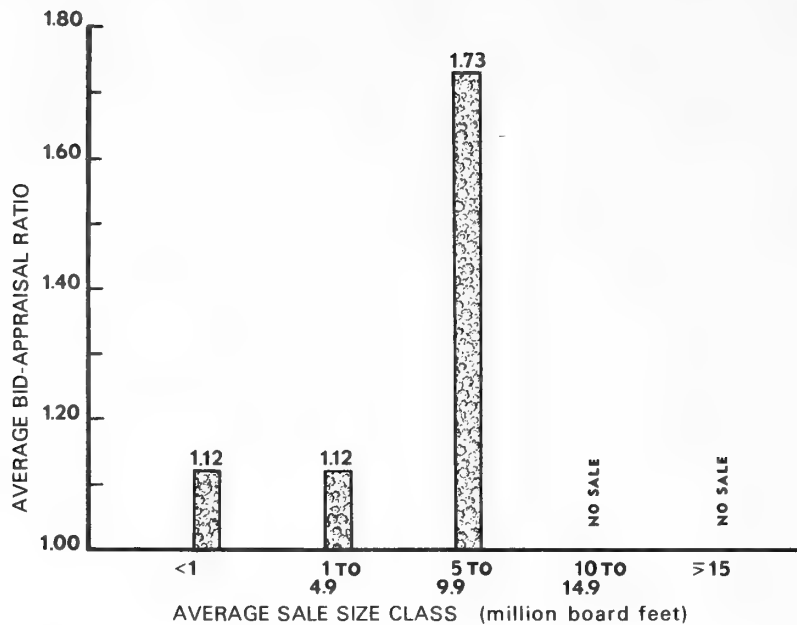


Figure 8.—Average bid-appraisal ratio by sale size classes for all Bureau of Land Management oral-auction timber sales, east side, 1951-62.

Size of Buyer

West Side

FOREST SERVICE SALES.—In the 4-year period being analyzed, the large firms on the west side purchased 22.6 percent of all timber volume sold by the Forest Service.¹¹ The remaining 77.4 percent was sold to all other buyers (small firms). The large firms obtained 11.6 percent of their volume in one-bidder sales, while small firms obtained 9.9 percent of their volume under similar conditions (table 3). Further, the large firms purchased 22.2 percent of their volume in the token-bid class. In contrast small firms purchased only 15.5 percent of their volume in this noncompetitive class where bidding is at a minimum. The balance of timber

purchased by both groups fell in the competitive class where large firms obtained 66.2 percent or about two-thirds of their volume and small firms obtained 74.6 percent or approximately three-fourths of their volume.

The small firms, in addition to purchasing a large share of their timber under competitive conditions, paid a significantly higher premium over appraised price for such competitive sales. The small firms paid a premium of 68 percent over appraised value for timber purchased under competitive conditions. In contrast, the premium paid by large firms was only 43 percent, and this applied to a smaller share of their total volume purchased.

Since all sales classified as noncompetitive were transacted without significant premium over appraised value, the premium for all purchases, competitive plus noncompetitive, is substantially lower than the premium for competitive sales alone.

¹¹ Large firms consist of the 20 largest lumber producers, the 20 largest plywood producers, and the eight largest timberland owners. (Purchases by Simpson Timber Co., in the Shelton Working Circle under a cooperative sustained yield agreement, were not included in this study.) A list of large west-side firms is given on page 63.

Table 3.—Characteristics of Forest Service oral-auction timber sales to large firms¹ compared with small firms,² west side, 1959-62

Kind of sale and firm size	Volume	Percent of total volume	Average bid-appraisal ratio (weighted)	Average number of bidders per sale	Average volume per sale	Percent of sales requiring road construction	Average road construction cost for sales requiring road construction
	M bd. ft.				M bd. ft.		Dollars
Noncompetitive:							
One-bidder:							
Large firms	298,499	11.6	1.00	1.00	4,502	68.7	69,263
Small firms	873,457	9.9	1.00	1.00	2,531	58.1	34,594
Token-bid:							
Large firms	570,463	22.2	1.00	2.91	8,022	88.6	87,294
Small firms	1,366,123	15.5	1.00	3.10	5,160	72.1	63,931
Competitive:							
Large firms	1,699,750	66.2	1.43	4.80	7,454	84.2	76,011
Small firms	6,573,657	74.6	1.68	5.36	4,841	69.7	56,785
Total sales:							
Large firms	2,568,712	100.0	1.28	3.72	7,014	82.2	77,330
Small firms	8,813,237	100.0	1.51	4.29	4,483	68.0	54,531

Source: Developed from quarterly reports of U.S.D.A. Forest Service, Region 6, National Forest advertised timber sales, Portland, Oregon.

¹ The 20 largest lumber producers, the 20 largest plywood producers, and the eight largest timberland owners. (Purchases by Simpson Timber Co., in the Shelton Working Circle under a cooperative sustained yield agreement, were not included in this study.)

² All buyers other than the large firms as defined above.

The overall premium reflects not only the important difference in proportions between competitive and noncompetitive sales but the differing premiums on the competitive portion as well. As a result, the large firms acquired their National Forest timber for an average premium of 28 percent over appraised value, whereas small firms paid a 51-percent premium over appraised price.

The foregoing is an examination of the difference in premium over appraised price where the entire west side is the unit. It may be of interest to compare premiums within those working circles where both large and small firms buy timber. Among the 43 west-side working circles, there were 36 in which both groups were successful bidders. In only seven of these 36 working circles did we find the large firms paying a higher premium than their smaller competitors for the timber purchased. In contrast, the small operators paid the higher premium in 28 working circles. In one working circle, the premiums were identical between the two groups. A listing of the working circles involved and the recorded bid-appraisal ratios is provided in table 4.

Table 4.—Bid-appraisal ratios for large firms and all others in Forest Service working circles where both buyer groups purchased timber, west side, 1959-62

Working circle	Bid-appraisal ratio by buyer groups		Working circle	Bid-appraisal ratio by buyer groups	
	Large firms	All others		Large firms	All others
Soleduck	1.21	1.28	Mapleton	1.19	1.15
Quilcene	1.25	1.39	North Santiam	1.51	1.27
Quinalt	1.00	1.13	South Santiam	1.10	1.33
Skagit	1.64	2.55	McKenzie	1.24	1.48
Suitttle	1.33	1.74	Lowell	1.38	1.54
Darrington	1.18	2.18	Oakridge	1.27	1.31
Skykomish	1.06	1.35	North Umpqua	1.17	1.26
Snoqualmie	1.72	1.64	South Umpqua	1.21	1.38
Green River	1.00	1.19	Coquille	1.20	1.18
Mineral	1.00	1.10	Rogue River	1.17	1.52
Packwood	1.16	1.33	(Siskiyou)		
Randle	1.21	1.82	Chetco	1.00	1.24
Spirit Lake	1.03	1.86	Josephine	1.15	1.51
Lewis River	1.60	1.56	Applegate	1.16	1.64
Mt. Adams	1.41	1.22	Ashland	1.22	1.32
Wind River	1.48	1.73	Butte Falls	1.14	1.52
Hood River	1.25	1.33	Rogue River	1.23	1.41
Clackamas-Sandy	1.80	1.80			
Hebo	1.29	1.44	Weighted average ¹	1.29	1.51
Waldport	1.53	1.32			

NOTE: Of these working circles, the largest premiums were paid by:

Large firms	7
Small firms	28
Same	1
Total	36

¹ Weighted average of all working circles, whether listed or not.

The data shown above on the premiums paid by economic size class were based upon *prices bid* for National Forest timber. For two reasons, the prices *actually paid* for such timber may not correspond precisely with the *bid prices*. First, the final buying price was subject to a price escalator provision whereby stumpage rates are adjusted up or down by 50 percent of the difference between the base period price index and a current price index for stumpage. Thus, if the stumpage price index should increase by \$2 per thousand from the base period, determined as of the date of the sale, the actual price paid would be increased by \$1 per thousand above the bid price. Similar adjustments are made if the stumpage price index should decline. The escalator provision has applied to west-side timber since the spring of 1961; for east-side timber, the escalator provision has applied throughout the period under study. Adjustments that are made in the stumpage price as a result of changes in the stumpage price index presumably are randomly distributed between large and small firms. Thus, we have no reason to suspect that changes made in the premium over appraised price would significantly affect the premium differentials by economic size class shown above.

Second, the procedure called rate redetermination is required on large timber sales, which tended to reduce the effective price for those sales where bidding had significantly exceeded the appraised price during the period of this study. The Forest Service Manual¹² states that "Rate redetermination will be required in contracts for all sales where the operation, including development, requires more than four full operating seasons." Thus, for large sales, competitive bidding determines the price of the minimum volume which must be removed prior to the point of rate redetermination. The minimum volume appears to vary between 40 and 60 percent of the total volume for large sales and averages 50 percent of the total volume. Competitive bidding does not affect the price of timber remaining in the sale after rate redetermination in large sales when bidding has significantly exceeded the appraised price. Rather, re-appraisal is based on the same procedures used to establish the original appraised price. We may

illustrate the effect of rate redetermination by a hypothetical example. Let us consider a sale having the following conditions: (1) total volume estimated and actually produced, 20 million feet; (2) a bid price exceeding appraised price by 100 percent; (3) rate redetermination taking place when 50 percent of the total production has been removed; and finally, (4) no basic changes occurring in the underlying economic data affecting stumpage value during the previous life of the contract. Under these circumstances, rate redetermination would normally restore the original appraised price for the second half of total log production. Thus, 10 million feet would be sold at a 100-percent premium over appraised price as given by the bid price, and the remaining 10 million feet would be sold at the redetermined rate which, in this example, would equal the appraised price. The final cost of the timber would involve not a 100-percent premium over appraised price but an average 50-percent premium. Since the period over which sales were examined here, the Forest Service rate redetermination procedure has been changed so that the bid premium is also applied to the redetermined appraisal.

Table 3 shows that the average size of sales purchased by large firms was substantially greater than sales purchased by smaller firms. Since large sales are more likely to involve rate redetermination, and large sales tend to be concentrated among large firms, then downward adjustments due to rate redetermination would reduce the premiums paid by large firms more than they would reduce the premiums paid by smaller firms. Thus, whereas the escalator factor appears to have had no significant effect on the differential premiums by economic size class, the rate redetermination factor would have had differential effects with the result that the premium advantage enjoyed by large firms was even greater than the very significant differentials shown in table 3. The analysis contained in the report is based entirely on the published bid prices and not upon the actual prices, which differ due to operation of the escalator provision and the rate redetermination process. The reader, however, is asked to keep in mind these two qualifications.

¹² U. S. D. A. Forest Service. Forest Service Manual, 2423.8, R-6 Supplement No. 101.

Other sale characteristics representing differences by size of buyer are also shown in table 3. In all three competitive categories, the average volume per sale in sales purchased by large firms was significantly larger than that of small firms.

For uncontested sales, the average sale size of large firm purchases exceeded the small firm purchases by 78 percent. For the token-bid sales, the differential was 55 percent. And for competitive sales, the average sale size purchased by large firms exceeded that of their smaller competitors by 54 percent. Overall, the differential was 56 percent.

Similarly, differences existed in the average number of bidders per sale between sales acquired by large firms compared to small firms on the west side. By definition there is only one bidder in the uncontested sale. For the token-bid sale, the number of firms qualified to bid at sales where a large firm was the successful bidder averaged 2.91 bidders per sale. Where a small firm was the successful bidder in a token-bid sale, the average number of bidders per sale amounted to 3.10. Among the competitive sales, there was an average of 4.80 bidders per sale qualified to bid where a large firm was the successful bidder. Where a small firm was the successful bidder, there were 5.36 qualified bidders on the average.

The average road construction cost, the percent of sales requiring construction, and the average sale size are all substantially greater for large firms for each of the three sale classes shown in table 3. These factors would appear to be related to degree of competition for Federal timber and therefore to the premium paid over appraised price. A large sale requires a greater degree of financing than a small sale. Financial competence must be established by a successful bidder. An accompanying large road construction cost requirement further increases the financial obligation. The greater the financial requirements on account of sale size and road construction cost, the fewer will be the number of small firm bidders able to compete for a given sale.

On the other hand, larger firms with greater financial resources have more interest in larger sales and hence may become qualified bidders for large sales, whereas they are less interested and may not qualify to bid on small sales. Thus, even though sale size is a barrier to entry for

small operators, it may not reduce the number of bidders. Instead, it changes the composition of bidders from small operators to a higher proportion of large firms.¹³ But among larger firms that may have a longer term operating horizon and more permanent associations in their communities, there appears to be a tendency to avoid competition with other qualified bidders. This is particularly true on the west side where the record shows that the big firms obtained a significantly larger share of single-bid and token-bid sales than did the smaller firms. Thus, there is a logical relationship between degree of competition, on one hand, and barriers to entry in the form of sale size and road construction cost, on the other.

BUREAU OF LAND MANAGEMENT SALES.—

Large firms purchased 22.8 percent of the Bureau of Land Management timber sold on the west side during the period 1951-62 (table 5). Both size classes of firms purchased about seven-tenths of their total volume competitively; large firms acquired 70.5 percent of their total volume through competitive sales and small firms purchased 69.4 percent. The balance, 29.5 percent for large firms and 30.6 percent for small firms, was obtained in noncompetitive sales. This percentage distribution in sale type differs from Forest Service sales where smaller firms obtained a larger proportion of their sales competitively than did large firms.

Bureau of Land Management sales also differed from Forest Service sales when premiums paid by large as compared with small firms were examined. In the Forest Service sales, the premium paid by small firms was substantially higher. For Bureau of Land Management sales there was little difference in the premium over appraised price as related to firm size. The small firms paid a premium of 47 percent of appraised value for sales purchased competitively, and large firms paid a 46-percent premium. For all sales, including those purchased noncompetitively, small firms paid a premium of 34 percent and large firms paid 33 percent.

¹³ It would be difficult to formally quantify and demonstrate this point. An examination of the names of qualified bidders in a large number of individual sales produces a clear pattern. The qualified bidders for large sales are generally well-known and well-established firms, whereas small-sale bidders consist of a few established firms plus other operators whose firm names are not well known in the industry. The picture is often confused by private arrangements whereby a logger will be bidding on behalf of, and financed by, another firm.

Table 5.—Characteristics of Bureau of Land Management oral-auction timber sales to large firms¹ compared with small firms,² west side, 1951-62³

Kind of sale and firm size	Volume	Percent of total volume	Average bid-appraisal ratio (weighted)	Average number of bidders per sale	Average volume per sale
	M bd. ft.				M bd. ft.
Noncompetitive:					
One-bidder:					
Large firms	488,585	28.2	1.00	1.00	3,257
Small firms	1,782,722	30.3	1.00	1.00	2,380
Token-bid:					
Large firms	22,915	1.3	1.00	1.80	4,583
Small firms	15,036	.3	1.00	1.91	1,367
Competitive:					
Large firms	1,219,542	70.5	1.46	2.66	3,608
Small firms	4,076,531	69.4	1.47	3.01	2,320
Total sales:					
Large firms	1,731,042	100.0	1.33	2.14	3,511
Small firms	5,874,289	100.0	1.34	2.41	2,334

Source: Developed from quarterly reports of Bureau of Land Management, "Results of Timber Sales," Portland, Oregon.

¹ The 20 largest lumber producers, the 20 largest plywood producers, and the eight largest timberland owners. (Purchases by Simpson Timber Co., in the Shelton Working Circle under a cooperative sustained-yield agreement, were not included in this study.)

² All buyers other than the large firms as defined above.

³ Data not available for percent of, and average road construction cost for, sales requiring road construction.

Further information on bid premiums as related to firm size can be obtained by comparing the results in the 12 west-side master units. In contrast with the results of our Forest Service working circle examination, we find that large firms paid a higher premium in eight of the 12 master units, and smaller firms paid a higher premium in only four master units (table 6).

Table 6.—Bid-appraisal ratios for large firms and all others in Bureau of Land Management master units where both buyer groups purchased timber, west side, 1951-62

Master unit	Large firms	All others
Alsea-Rickreall	1.43	1.45
Clackamas-Molalla	1.64	1.55
Columbia	1.42	1.35
Douglas	1.34	1.23
Jackson	1.25	1.32
Josephine	1.50	1.22
Klamath	1.68	1.29
Santiam	1.23	1.34
Siuslaw	1.40	1.52
South coast	1.27	1.26
South Umpqua	1.31	1.20
Upper Willamette	1.46	1.43
Weighted average	1.33	1.34

NOTE: Master units in which largest premiums were paid by:

Large firms	8
Small firms	4
Total	12

Unlike Forest Service sales, where provisions for price escalation and rate redetermination exist, the prices bid for Bureau of Land Management timber are the prices that apply over the duration of the sale. For this reason, no advantage accrues to a firm that is able to purchase a large sale, and the examination of prices paid for BLM timber is not subject to price adjustment qualifications.

In relating sale size to size of buyer, we find results similar to those for Forest Service sales; in all cases, the average sale size for large firm purchases exceeded that for sales purchased by small firms. For single-bidder sales, the average sale size for purchases by large firms was 37 percent larger; for token-bid sales, large firm purchases were more than three times the size of small firm volume; and for competitive sales, the average large firm sale volume was 56 percent greater than small firm volume. For all sales combined, the difference was 50 percent.

Sales purchased by large firms also averaged fewer bidders per sale. For token-bid sales, this difference was not great; large firm purchases averaged 1.80 bidders whereas purchases by small

firms averaged 1.91. This would be expected since the uncertainty underlying Forest Service token-bid sales is eliminated in the Bureau of Land Management sale procedure. Competitive sales acquired by large firms averaged 2.66 bidders per sale. In contrast, when a competitive sale was purchased by a small firm, an average of 3.01 bidders qualified to bid.

Sale size may be a financial barrier to entry here just as it may be for Forest Service sales. However, unlike the evidence shown in our examination of Forest Service sales, competition between large firms appears to be just as intense as between small firms for BLM sales.

East Side

FOREST SERVICE SALES.—The large firms on the east side, though fewer in number, occupied a more important position as buyers of National Forest timber than the large firms of the west side.¹⁴ The Big Eight of the east side purchased 37.1 percent of all National Forest timber sold by oral auction, leaving 62.5 percent for all other purchases. The large firms obtained 45.1 percent of their purchased volume under one-bidder conditions, whereas small firms obtained only 28.8 percent of their volume as one-bidder buyers (table 7). The token-bid sales showed the opposite relationship; namely, the small firms purchased a

larger share, 33.1 percent of their volume with token bids compared with 28.3 percent by large firms. However, the large firms were able to purchase in total substantially more of their timber under noncompetitive conditions relative to the small firms. Only 26.6 percent of the large firm purchases were under competitive conditions, whereas 38.1 percent of the small purchases were competitive.

The average premiums paid by the two purchaser groups for their competitive sales were almost identical. The difference in premiums paid between the two groups originates rather with the percent acquired under noncompetitive conditions. Thus, the overall cost of National Forest timber to the large firms involved a 16-percent premium, whereas the smaller firms paid a 23-percent premium.

If we examine the premiums paid by each of the two groups for timber purchased in those working circles in which both groups were successful buyers, we find the same premium pattern emerging. Table 8 shows 15 east-side working circles in which both firm-size groups purchased timber. In only four did the large firms pay a premium in excess of that paid by small firms. In contrast, in 10 working circles the smaller firms paid the larger premium. In one working circle, the premiums were identical.

¹⁴ The list of large firms on the east side is given on page 63.

Table 7.—Characteristics of Forest Service oral-auction timber sales to large firms¹ compared with small firms,² east side, 1959-62

Kind of sale and firm size	Volume	Percent of total volume purchased by group	Average bid-appraisal ratio (weighted)	Average number of bidders per sale	Average volume per sale	Percent of sales requiring road construction	Average road construction cost for sales requiring road construction
	M bd. ft.				M bd. ft.		Dollars
Noncompetitive:							
One-bidder:							
Large firms	634,381	45.1	1.00	1.00	9,959	81.3	70,937
Small firms	682,499	28.8	1.00	1.00	4,311	74.8	33,876
Token-bid:							
Large firms	398,226	28.3	1.00	2.52	15,809	96.0	108,824
Small firms	784,068	33.1	1.00	2.45	8,207	88.0	61,043
Competitive:							
Large firms	374,270	26.6	1.59	3.15	9,357	90.0	58,624
Small firms	902,140	38.1	1.60	3.64	4,210	78.1	24,410
Total sales:							
Large firms	1,406,877	100.0	1.16	1.96	10,906	86.8	75,098
Small firms	2,368,707	100.0	1.23	2.50	5,034	79.0	35,534

¹ The eight largest lumber-producing firms on the east side.

² All buyers other than the eight firms above.

Table 8.—Bid-appraisal ratios for large firms and all others in Forest Service working circles where both buyer groups purchased timber, east side, 1959-62

Working circle	Large firms	All other
Okanogan	1.23	1.32
Ellensburg	1.35	1.59
Naches Tieton	1.34	1.08
West Klamath	1.05	1.60
East Klamath	1.22	1.28
Deschutes Plateau	1.23	1.15
Crooked River	1.05	1.07
Burns	1.00	1.01
John Day	1.00	1.07
Burnt River	1.00	1.40
Elkhorn	1.00	1.04
Pendleton-Pilot Rock	1.29	1.36
Grande Ronde (Wallowa-Whitman)	1.37	1.01
Union	1.00	1.00
Wallowa	1.08	1.01
Weighted average ¹	1.16	1.23

NOTE: Of these working circles, the largest premiums were paid by:
 Large firms 4
 Small firms 10
 Same 1
 Total 15

¹ Weighted by volume for all working circles whether listed or not.

The differences noted for the west side in average volume per sale are found emphasized for east-side Forest Service sales. Again, for all three competitive categories of sales, the average sale size purchased by large firms was substantially larger than for the small firms. Overall, the average volume per sale purchased by the large firms exceeded that of the small firms by more than twofold.

The average number of bidders per sale on the east side differed substantially between sales purchased by large firms relative to those purchased by small firms. Overall, there was an average of 2.5 bidders qualified to bid for those sales purchased by small firms. In contrast, the sales acquired by large firms registered only 1.96 average bidders per sale. Unlike the west side, this relationship was not consistent. The token sales on the east side averaged slightly more bidders per sale competing for the timber purchased by large firms relative to the small firm sales.

The road construction factors identified for Forest Service sales on the west side were found in nearly identical form on the east side. The single difference in the buyer-size relationship was one of magnitude and reflected differences in sale size. The average road construction cost for sales to large firms was more than double the average cost for road construction for sales to small firms.

BUREAU OF LAND MANAGEMENT SALES.—Few comparisons can be made between large and small firm purchases of BLM timber on the east side. Only two of 149 sales were purchased by large firms, both in the single-bidder class (table 9).

Table 9.—Characteristics of Bureau of Land Management oral-auction timber sales to large firms¹ compared with small firms,² east side, 1951-62³

Kind of sale and size of firm	Volume	Percent of total volume	Average bid-appraisal ratio (weighted)	Average number of bidders per sale	Average volume per sale
	M bd. ft.				M bd. ft.
Noncompetitive:					
One-bidder:					
Large firms	3,332	100.0	1.00	1.00	1,666
Small firms	96,304	58.0	1.00	1.00	1,082
Token-bid:					
Large firms	--	--	--	--	--
Small firms	2,122	1.3	1.00	2.00	1,061
Competitive:					
Large firms	--	--	--	--	--
Small firms	67,692	40.7	1.37	2.50	1,209
Total sales:					
Large firms	3,332	100.0	1.00	1.00	1,666
Small firms	166,118	100.0	1.16	1.59	1,130

Source: Developed from quarterly reports of Bureau of Land Management, "Results of Timber Sales," Portland, Oregon.

¹ The eight largest lumber-producing firms on the east side.

² All buyers other than the eight firms above.

³ Data not available for percent of, and average road construction cost for, sales requiring road construction.

DIFFERENCES IN COMPETITION AMONG NATIONAL FOREST WORKING CIRCLES AND BUREAU OF LAND MANAGEMENT MASTER UNITS

The differences observed among Federal timber sales in the preceding section are primarily attributable to differing competitive conditions in the areas where the sales are made and to the

different bidder qualification procedures followed by the two agencies. To examine the effect of competition, a suitable means of measuring differences in competition must be found.

Measures for Identifying the Strength of Competition by Forest Service Working Circle or Bureau of Land Management Master Unit

There are several possible measures of competitive performance by working circles or master units. Three will be considered here:

1. *The weighted average bid-appraisal ratio* might be used to measure the extent of competition in these areas. Thus, a high ratio would be taken as an indicator of intense competition, and a low ratio or 1.00 would indicate minimal or no competition. However, this measure is not without its faults. It may be particularly weak when averaged because it obscures competitiveness on individual sales. Further, if bidders tend to offer nearly constant dollar premiums over appraised prices, then a given dollar premium bid will produce a high bid-appraisal ratio where the appraised price is low and the opposite where the appraised price is high. Although the bid-appraisal ratio as a measure of extent of competition may have its shortcomings, if used with caution and an appreciation for other differences among the several working circles and master units, it is still a useful indicator of competition.

2. *The average number of bidders per sale* may also be used as an indicator of the strength of competition. If there are many sales having only one qualified bidder, competition may be considered minimal. Yet, as illustrated in the case of token-bid sales, the presence of several qualified bidders may not necessarily indicate effective competition. The record contains many illustrations of several bidders qualifying themselves to bid for a given sale, but failing to cast an oral-auction bid. This measure also has the weakness of all averages — it obscures variation of individual sales. Further, as Weintraub¹⁵ points out, "through appraisal technique alone the number of bidders will be reduced and the situation may end up with only a single bidder present." Thus, by a sufficiently high appraisal, all bidders except the

¹⁵ Weintraub, Sidney. An examination of some economic aspects of Forest Service stumpage prices and appraisal policies. 201 pp., illus. 1958. (Unpublished report prepared for Forest Service, U. S. Dep. Agr. On file at Pacific Northwest Forest & Range Exp. Sta., Portland, Oregon.)

single most efficient firm, or the firm most desperately in need of timber, may be eliminated from bidding. Although this situation is conceivable, it hardly seems likely, since appraisals are made to the "average efficiency" firm and in view of the large number of competitive sales taking place at substantial premiums over appraised price (on the west side, 63 percent of Forest Service sales and 70 percent of Bureau of Land Management sales). There is sufficient supervision of appraisal technique to provide uniformity among working circles and master units and between sales. As in the instance of the bid-appraisal ratio, the average number of bidders is not without its faults as an indicator of the extent of competition, but is a useful measure if used cautiously.

3. *The percent of total volume sold which is purchased under competitive conditions*, as here defined, is another measure that has considerable merit as an indicator of competitive pressure in working circles and master units. As competition is here defined, a competitive sale must have two or more bidders who make serious oral-auction bids above the appraised price. A serious bid in turn is defined as a bid at least one-half of 1 percent in excess of appraised price. The competitive

sale therefore excludes both the one-bidder sale and the token-bid sale. Percent of volume sold competitively, or percent competitive, is therefore defined as the ratio of competitive sales to total sales where competitive sales are identified as those sales having a bid-appraisal ratio equal to or greater than 1.01. A fault of the percent competitive measure in identifying competitive and non-competitive areas is that it says nothing about the degree of competition for the sales volume classified as competitive. In other words, a competitive sale may be one in which two bidders have raised the price 1 percent above the appraised price, or a dozen bidders may have doubled the appraised price.

It is judged that percent competitive is the most sensitive and least faulty for use in measuring competition. Therefore, in judging the extent of competition by working circles and master units, the percent competitive will be used as the primary measure, with secondary attention given to the bid-appraisal ratios and the average number of bidders. This measure will be used as the dependent variable in the multiple regression analysis where we will attempt to "explain" the observed differences in degree of competition among the working circles and among the master units.

Timber Sale Characteristics on Forest Service Working Circles and Bureau of Land Management Master Units

To identify the characteristics of the working circles and master units, a classification system based on percent competitive has been established. This classification system is not independent of the working circles and master units to be classified. The record shown in tables 10 and 11 was examined for natural breaks in the data and judgments were made about the extent of competition in individual areas, based on discussions with buyers

in many areas. The areas were classified as "highly competitive" if they had a weighted average percent of volume sold under competitive conditions between 85 and 100 percent. At the other extreme, areas having less than 60 percent of volume sold competitively were classified as areas of minimal competition. Areas having between 60 and 85 percent of volume sold under competitive conditions were classified as "intermediate" in degree of competition.

Table 10.—Degree of competition by Forest Service working circle, arrayed according to percent of volume competitive, west side, 1959-62¹

Working circle	Number of sales	Total volume sold by oral auction	Percent of volume competitive	Bid-appraisal ratio, all sales	Average number of bidders, all sales	Average volume per sale
		M bd. ft.				M bd. ft.
Highly competitive:						
Cedar River	2	7,360	100.0	1.32	3.00	3,680
Hood River	29	143,495	99.9	1.32	3.17	4,948
Lewis River	31	406,945	99.8	1.57	5.03	13,127
Suittle	21	75,055	98.9	1.65	10.95	3,574
Green River	4	27,080	96.0	1.18	2.50	6,770
Baker River	24	130,672	95.3	3.16	6.92	5,445
Clackamas-Sandy	182	1,017,830	93.1	1.80	5.47	5,592
Wind River	46	235,535	93.1	1.71	3.11	5,120
White River	30	115,855	92.7	1.40	4.43	3,862
McKenzie	140	496,652	91.0	1.47	3.99	3,548
Lowell	79	388,285	87.6	1.50	5.46	4,915
Canyon Creek	27	118,550	86.1	1.76	4.26	4,391
Glacier	28	106,392	85.9	2.99	3.89	3,800
Intermediately competitive:						
Quilcene	32	216,450	82.6	1.33	3.94	6,764
Soleduck	32	221,575	82.3	1.28	4.19	6,924
Waldport	87	434,864	81.8	1.41	4.49	4,998
Rogue River (RR)	70	268,710	81.6	1.35	5.54	3,839
South Umpqua	99	399,230	80.8	1.32	4.77	4,033
Snoqualmie	7	46,458	78.7	1.69	3.57	6,637
Randle	67	375,870	76.1	1.73	6.31	5,610
Skagit	15	98,830	74.1	2.53	7.53	6,589
Darrington	50	240,178	73.2	2.14	11.22	4,804
S. Fork Stillaguamish	25	138,550	72.2	1.42	4.40	5,542
North Santiam	67	303,080	70.8	1.34	3.73	4,524
Hebo	66	263,650	69.9	1.36	3.79	3,995
Josephine	87	227,622	68.5	1.50	3.37	2,616
Oakridge	162	824,161	67.1	1.28	3.29	5,087
Rogue River (Siskiyou)	47	286,947	63.3	1.42	3.57	6,105
North Umpqua	153	802,771	62.8	1.24	4.56	5,247
Ashland	25	80,345	62.4	1.28	3.00	3,214
Minimally competitive:						
Packwood	62	268,440	59.9	1.30	4.05	4,330
Cottage Grove	58	205,550	58.3	1.32	2.83	3,544
Spirit Lake	15	123,615	57.9	1.62	2.93	8,241
Butte Falls	30	112,605	57.5	1.17	4.90	3,754
South Santiam	100	366,489	56.6	1.20	2.53	3,665
Chetco	27	130,745	54.8	1.24	2.22	4,842
Applegate	19	84,875	51.0	1.50	2.84	4,467
Coquille	29	107,550	49.3	1.18	2.21	3,709
Mt. Adams	72	388,385	48.3	1.23	2.47	5,394
Mapleton	113	502,631	47.4	1.17	2.42	4,448
Quinalt	46	325,142	44.9	1.13	2.30	7,068
Skykomish	20	130,665	42.4	1.14	3.10	6,533
Mineral	15	136,260	28.4	1.17	3.00	9,084
Shelton	8	189,260	0.0	1.00	1.13	23,685

¹ See table 13, page 43.

Table 11.—Degree of competition by Bureau of Land Management master unit, arrayed according to percent of volume competitive, west side, 1951-62

Master unit	Total volume sold by oral auction	Percent of volume competitive	Bid-appraisal ratio, all sales	Average number of bidders, all sales	Number of sales	Average volume per sale
	M bd. ft.					M bd. ft.
Highly competitive:						
Clackamas-Molalla	209,986	88.6	1.57	2.50	88	2,386
Intermediately competitive:						
Siuslaw	867,553	83.47	1.51	2.79	468	1,854
Klamath	146,068	82.32	1.30	2.75	57	2,563
Upper Willamette	614,161	81.49	1.43	2.60	303	2,027
Jackson	522,372	77.64	1.30	2.49	194	2,693
Alsea-Rickreall	636,568	72.10	1.44	2.18	258	2,467
Santiam	581,072	71.77	1.31	2.40	192	3,026
Columbia	414,908	71.48	1.37	2.47	189	2,195
South Coast	1,452,602	67.91	1.26	2.15	389	3,734
Minimally competitive:						
Douglas	1,143,224	56.23	1.26	2.07	483	2,367
South Umpqua	257,872	55.15	1.22	1.97	105	2,456
Josephine	758,945	54.75	1.22	2.18	284	2,672

West-Side Working Circles

Table 10 shows that the 13 working circles classified as highly competitive on the basis of percent competitive averaged three or more bidders per sale with one exception, and, with the same one exception, had a weighted average bid-appraisal ratio equal to or larger than 1.32. The 14 working circles classified as having only minimal competition with three exceptions averaged three bidders per sale or less and, with three exceptions, had a weighted average bid-appraisal ratio of 1.30 or less.

The spread between most competitive and least competitive working circles runs the entire range of possibilities, from 100 percent competitive in the Cedar River Working Circle to legally precluded competition in the Shelton Working Circle. Neither working circle at the two extremes was representative, however. There were only two sales on the Cedar River Working Circle in the 4-year period under study; and, as pointed out earlier, the Shelton Working Circle was covered by a cooperative sustained yield agreement. On the Hood River Working Circle of the Mount Hood National Forest, all sales except one involved serious challenge. The one exception was a small (100,000 board feet) single-bidder sale. The largest volume working circle on the west side was the Clackamas-Sandy Working Circle, also the the Mount Hood National Forest. This was one of the most intensely competitive areas in the entire region. Competitive sales accounted for 93.1 percent of all volume sold. Further, there was an 80-percent premium over appraised price paid for timber purchased within this working circle. The high premium, moreover, cannot be accounted for by a low appraised price, since the average appraised price for the working circle was \$15.01 per thousand board feet for all oral-auction timber. This compares with \$16.75 average appraised price for all oral-auction sales on the west side. Finally, the average number of bidders qualified to bid on oral-auction sales within the Clackamas-Sandy Working Circle was 5.47, compared with 4.20 for the west side (excluding the Shelton Working Circle).

West-Side Master Units

There are 12 Bureau of Land Management master units on the west side. Under the same classification system, eight master units were classed as having intermediate competition, three had min-

imal competition, and only one, the Clackamas-Molalla Master Unit, was classed as highly competitive (table 11).

There was some decline in the weighted average bid-appraisal ratios and in average number of bidders per sale as the percent competitive by master unit declined. The Clackamas-Molalla Master Unit was characterized by a lower total sale volume and a smaller number of sales than the average for all master units. On the other hand, the two largest volume master units — South Coast and Douglas — were ranked near the bottom in terms of percent competitive.

The range in percent competitive was much narrower for master units as compared with working circles. We would expect this difference since master units generally cover much larger areas and would therefore be less likely to show competitive extremes found in the more confined working circles.

East-Side Working Circles

On the east side, the spread between the most competitive and the least competitive working circles shown in table 12 was nearly as extreme as that found on the west side. Five small working circles had no competitive sales during the 4-year period. The Burns, Wenatchee, and Lakeview Working Circles were all subject to competition and yet less than 6 percent of the total volume sold was transacted under competitive conditions. At the other end of the competitive spectrum, the Grande Ronde Working Circle of the Umatilla National Forest recorded 90.4 percent of all volume sold as competitive.

By applying the same classification system established for the west side to the east side, we found that only two of the 26 east-side working circles fell within the highly competitive classification, only three were in the intermediate classification, and the remaining 21 were classified as minimally competitive.

The difference in east-side and west-side competitiveness can be explained by comparison of some of their physical relationships. The spatial relationship between timber supply and milling facilities is quite different in the two subregions. On the east side, the timber is more scattered relative to the west side. National Forest timber sales on

Table 12.—Degree of competition by Forest Service working circle, arrayed according to percent of volume competitive, east side, 1959-62

Working circle	Total volume of all oral-auction sales	Percent of volume competitive	Bid-appraisal ratio for all sales	Average number of bidders, all sales
<u>M bd. ft.</u>				
Highly competitive:				
Grande Ronde (Umatilla)	58,576	90.4	1.71	3.38
Ellensburg (Cle Elum)	161,620	88.6	1.44	4.48
Intermediately competitive:				
West Klamath	197,025	83.1	1.60	3.82
East Klamath	274,940	81.3	1.25	2.55
Winema	50,525	61.2	1.10	2.16
Minimally competitive:				
N. Fork (Pendleton-Pilot Rock)	179,229	57.8	1.33	2.90
Clearwater	29,700	57.6	1.15	2.33
Grande Ronde (Wallowa-Whitman)	73,041	51.1	1.36	2.43
East Side	145,990	49.7	1.73	3.38
Deschutes Plateau	510,376	36.1	1.19	2.38
Morrow (Heppner)	54,239	32.6	1.20	2.00
Okanogan (Chelan)	216,569	28.0	1.26	1.73
Elkhorn	136,294	22.4	1.04	1.95
John Day	195,835	17.5	1.05	2.03
Burnt River	66,278	12.3	1.10	1.44
Wallowa	91,980	11.6	1.06	1.94
Crooked River	261,695	11.5	1.07	1.94
Naches Tieton	189,040	11.2	1.24	1.68
Burns	336,164	5.9	1.00	1.32
Wenatchee	138,670	5.1	1.05	2.05
Lakeview	164,632	4.2	1.01	1.28
Union	73,330	0.0	1.00	2.60
Pine	24,300	0.0	1.00	2.50
Entiat	55,610	0.0	1.00	1.14
Middle Fork	54,826	0.0	1.00	1.00
Chelan	35,100	0.0	1.00	1.00

the east side averaged only 2.8 thousand board feet per acre, whereas west-side timber sales averaged 30.7 thousand board feet per acre. At the same time, on the west side in 1961, there were 532 active sawmills and 124 active veneer and plywood plants. In contrast, on the east side there were very few veneer and plywood plants in operation and only 196 sawmills. With timber more widely scattered and fewer processors interested in buying timber, we should expect that in any given location there would be fewer potential bidders for Federal timber on the east side than would be expected on the west side. In fact, the number of bidders per sale averaged 2.39 on the east side and 4.19 on the west side. For this reason, east-side sales would be more frequently uncontested sales with timber more often being sold at the appraised price.

East-side Bureau of Land Management lands are not divided into master units. Because of this and because few sales are made on the east side, we will confine our BLM master unit analysis to the west side.

Nature of the Competitive Circumstance

For both regions, the working circles and master units may be classified as having minimal competition for several reasons. First, the situation in which the total annual log supply in a given area is approximately equal to or greater than the normal milling capacity of the region would presumably result in a high proportion of the timber sales being transacted at approximately the appraised price. One would expect to find some timber being sold at appraised price under one-bidder conditions. Where two or more bidders qualify to bid on a given sale, one would expect to find bidding limited to a few percentage points above appraised price. Second, minimal degrees of competition might also prevail in an area characterized by regular increases in timber offered for sale within the area, paired with a milling capacity situation lagging in its growth somewhat behind log supplies.

There is a third general situation which might lead to evidence of minimal competition. In this

situation, there are relatively few buyers with normal milling capacity in excess of the total log supply available within the area. Unrestrained competition would normally lead to relatively high premiums over appraised price. The function of competition in a situation of this kind would be to ration the relatively scarce timber by means of the price system with the result that timber is allocated to the highest bidders who presumably are also the most efficient operators. By this process, the least efficient producers would be unable to obtain timber — or do so at prices which would not allow profitable operations — and eventually would be forced to withdraw from the market. In a situation in which there are few rather than many potential bidders for timber, it can be easier for the few to allocate the scarce raw material among themselves. A possible result is that bidding becomes restrained, that buyers “take turns” as successful bidders, that several or all producers within the area receive less timber than they would like to have, and finally, that some inefficient producers may be able to maintain operations.¹⁶

Relationship Between Observed Competition and Quantifiable Variables

The following analysis attempts to define the relationship between the degree of observed competition among working circles and among master units and other measurable variables which may offer an explanation of the varying degrees of observed competition. Our measure of the degree of observed competition will be the percent competitive. This measure is defined as the ratio of competitive sales to total sales where competitive sales are identified as those sales having a bid-appraisal ratio equal to or greater than 1.01.

¹⁶ This sort of restrained competition might result in token-bid sales. For a further discussion of token-bid sales see pp. 155-157 in: Mead, Walter J. *Competition and oligopsony in the Douglas-fir lumber industry*. 276 pp. Berkeley: Univ. Calif. Press. 1966.

We start with the question: Why are certain working circles and master units observed to be highly competitive (to have relatively many sales where serious bidding is evident in a bid-appraisal ratio equal to or greater than 1.01), whereas others are found to be almost totally lacking in evidence of competition? Economic theory suggests several relationships which may explain the observed differences among these areas in percent competitive. We will use stepwise multiple regression analysis to test for these relationships in Forest Service and Bureau of Land Management timber sale areas.

Variables To Be Tested

The following variables will be used in an attempt to explain the observed differences in percent competitive among the specified areas.

1. The percent competitive should be a positive function of the number of bidders present in a given working circle or master unit. As an index of the number of bidders active in a given area, we may use the average number of bidders per sale. For the west side, the average number of bidders per working circle, excluding the Shelton Working Circle, varies from a low of 2.21 on the Coquille Working Circle (Siskiyou National Forest) to a high of 11.22 on the Darrington Working Circle (Mount Baker National Forest) (table 13). For the east side, the average number of bidders per sale varies from a low of 1.00 bidder per sale in the Middle Fork Working Circle (Malheur National Forest) and the Chelan Working Circle (Wenatchee National Forest) to a high of 4.48 bidders per sale on the Ellensburg Working Circle (Wenatchee National Forest) (table 14). The average number of bidders varies from a low of 1.97 bidders per sale on the South Umpqua Master Unit to a high of 2.79 bidders per sale on the Siuslaw Master Unit (table 23).

A linear relationship between number of bidders and percent competitive should not be expected. Sales having only one bidder are non-competitive by definition. In working circles and master units where there are many one-bidder sales, the average percent competitive will be correspondingly low. A sharp increase in percent competitive will be registered as two-bidder sales are encountered, but no sharp increase should be

expected for percent competitive as the average number of bidders increases beyond two bidders per sale. The logic of this situation suggests a curvilinear relationship. Accordingly, the arithmetic mean number of bidders will be transformed into a logarithmic value to be inserted into the linear multiple regression equation.

2. The percent competitive by working circles and master units should be a negative linear function of the proportion of timber purchased by large firms relative to small firms. The logic supporting this statement is that large firms are generally well-established firms within a given area and, in addition, are normally well financed relative to their smaller competitors. Well-established firms are there because they have survived the rigors of competition. The bidding situation within such an area would be relatively stable. Smaller firms are less likely to initiate a challenge of established firms' positions.

3. The percent competitive by working circles and master units should be a negative linear function of average sale volume. The logic of such a relationship is that small buyers are unable to finance large sales; hence, the number of small firms in competition for Federal timber declines as sale size increases. Stated in another way, large sales, by virtue of heavier capital requirements, represent a barrier to entry and therefore restrict bidder competition. Although the share purchased by big firms may adequately embrace the logical support offered here, we will include the possibility of a relationship between sale size and percent competitive beyond what may previously be accounted for by the second variable.

4. The percent competitive by working circles should be a negative linear function of the average road construction cost per sale. A high degree of interrelationship is to be expected between average volume per sale and average road construction cost. This high interrelationship (multicollinearity) results naturally from the fact that large sales may be made to facilitate road construction. We have no basis for hypothesizing about the dominant relationship between these alternative independent variables. They are offered as alternative hypotheses indicating that either may prove to be significant. But it is highly unlikely that both will enter the equation.

Due to the lack of road construction data for Bureau of Land Management sales, this hypothesis

will be tested only for Forest Service sales. Since a high degree of multicollinearity is expected between this variable and sale size, we should not lose a great deal in our explanation of percent competitive on Bureau of Land Management master units.

Additional variables can also be suggested where no practical means of testing are available. For example, one might hypothesize that highly competitive working circles or master units occur where established firms are challenged by "outsiders" attempting to establish a buyers' position in a given area, that percent competitive is positively correlated with the presence of feuding within given areas, or that changes in the level of allowable cut and changes in appraisal procedures have influenced competitiveness. Although these factors may assist in explaining the differing degrees of competition observed, there is no readily available means of testing their importance.

A word of caution is necessary at this point concerning the interpretation of multiple regression findings. Statistical analysis alone is not intended to establish the existence of causality or causal direction between several variables but, rather, it can only suggest relationships between variables. If causality is to be inferred, it must come as a result of deductive analysis as well as quantitative observations.

West-Side Working Circles

The four variables outlined above will be used as possible explanatory variables in a stepwise multiple regression analysis of the competitive differences between the 43 west-side working circles. Average values for each working circle represent sales taking place over the 4 years beginning with January 1959 and ending with December 1962. In all, 2,340 oral-auction west-side timber sales are represented, excluding those sales within the Shelton Working Circle.

In our stepwise regression analysis, we have regressed percent competitive (Y) on the logarithmic value of the average number of bidders (X_1) size of buyer (X_2), average sale size (X_3), and average road construction cost (X_4). X_3 and X_4 failed to enter the regression equation.¹⁷ Our

¹⁷ The final regression equation is:

$$Y = 47.65 + 52.26X_1 - 0.28X_2 \\ (14.12) \quad (0.11)$$

The values shown in parentheses are the standard errors of estimate for the regression coefficients.

regression equation has a coefficient of multiple regression $R = 0.59$, and a coefficient of determination $R^2 = 0.35$. Thus, by taking into consideration the logarithm of the average number of bidders and a measure of the importance of large firms in the west-side working circles, we are able to account for 35 percent of the total variation in the percent competitive among the working circles.

It has been the function of the stepwise multiple regression analysis to examine a complex competitive situation collectively. By this process we have found that the differences in competitive conditions among the working circles are in part a positive function of number of bidders and a negative function of the share of timber purchased by large firms relative to small firms. Average volume per sale and the average road construction cost are not important in explaining the variation in competitive conditions among working circles.

There is further evidence indicating a relationship between the importance of large firms in a geographical market and percent competitive. In interviews of persons involved in buying Federal timber, most small operators revealed a high degree of respect for the economic power of their large competitors and a feeling of futility concerning competition with large firms for timber sales. This "bidder futility" is based on four factors: (1) superior location of well-established large firms; (2) large firm ownership of private logging roads enabling "off highway" log transportation; (3) superior economic power of large firms because of private timber holdings, better financial position, and greater diversification resulting in more stable income; and (4) capital gains treatment of timber income.¹⁸

In addition, nothing has been said in the foregoing discussion about the possibility that large firms are more efficient than small firms. Mead¹⁹ examined this possibility and concluded that medium and medium-large firms appeared to be the most efficient. The complexities in lumber manufacturing, however, make conclusive evidence on this subject difficult to obtain.

Size alone may not provide for more efficient operations. Through integrated operations including plywood processing and marketing, as well as pulp and paper production and marketing, the large firm may achieve real economies and thereby become more efficient. Pulp and paper, in particular, is an industry probably subject to impressive economies of scale. If so, then integrated operations may well make a significant contribution to large-firm efficiency. Our conclusion concerning the issue of efficiency is therefore mixed and preliminary. Additional study is needed to resolve this issue.

West-Side Master Units

Only the hypotheses concerned with number of bidders, size of successful bidder, and volume per sale are tested for sales made on Bureau of Land Management master units; data on cost of road construction are not available.

The analysis of percent competitive by master units is weakened because there are only 12 observations corresponding to the 12 west-side master units. However, the analysis covers the period beginning with January 1951 and ending with December 1962, and the volume sold exceeds 200 million board feet in all but one of the master units. In total, the analysis includes 3,010 oral-auction sales.

Employing the stepwise regression technique used in the working circle analysis, except for the elimination of average road construction cost as an independent variable, we find that only the log of the number of bidders enters the regression equation.²⁰

The regression equation has a coefficient of multiple regression, $R = 0.87$, and a coefficient of determination, $R^2 = 0.75$. Therefore, we can explain 75 percent of the total variation in percent competitive among the master units by taking into account the average number of bidders per sale.

¹⁸ For a further discussion of "bidder futility" see pp. 220-228 in: Mead, Walter J. *Competition and oligopsony in the Douglas-fir lumber industry*. 276 pp. Berkeley: Univ. Calif. Press. 1966.

¹⁹ Pp. 11-31 in Mead (1966); see footnote 18.

²⁰ The regression equation is:

$$Y = -4.78 + 205.11X_1$$
(37.31)

The size of buyer variable, which entered our equation on west-side working circles, did not prove important here. The geographic characteristics of master units as compared with working circles may partially explain the lack of firm size importance. There were only 12 master units covering the entire western Oregon area. Because of their large size they encompassed much more diversified areas of economic conditions than did the smaller working circles. This greater diversification is also demonstrated by the range in percent competitive between the two area classifications. For master units, percent competitive ranged from 88.6 to 54.8. The west-side working circle range was much wider, from 100 percent competitive down to 28.4 percent (excluding the Shelton Working Circle).

East-Side Working Circles

When applying the same techniques of regression analysis to explain competitive differences among east-side working circles, we are confronted with data limitations. First, the east-side working circles were highly variable in percent competitive.²¹ Second, for the east side our number of observations was relatively low. There are only 26 working circles, 12 of which are very small. Only 14 working circles had 4-year total sales in excess of 100 million feet. In contrast, there were 43 west-side working circles and 37 of them had total sales in excess of 100 million feet. With so few reliable observations available on a working circle basis for the east side, our analysis is correspondingly weaker.

However, with these reservations in mind, we may proceed with the analysis, using the same four variables as on the west side. Again, the dependent variable is percent competitive and the four independents are the logarithmic value of the average number of bidders (X_1), percent purchased by large firms (X_2), average volume per sale (X_3), and average road construction cost per sale (X_4). In our stepwise regression analysis, two variables, X_1 and X_4 , enter the regression equation.²²

Our regression equation has a coefficient of multiple regression, $R = 0.81$, and a coefficient of multiple determination, $R^2 = 0.66$. Thus, by taking into consideration the logarithm of the average number of bidders and average road construction cost per sale in the east-side working circles, we are able to account for 66 percent of the total variation in the percent competitive.

Summary

The reader should bear in mind that the objective of regression analysis at this point has been to identify the factors which may "explain" the observed differences in degrees of competition among the west-side and east-side working circles and the west-side master units. At a later point, we will examine individual sales with a similar objective in mind — that of explaining observed differences in degrees of competition by sale. We have established that the dominant variable which accounts for differences in percent competitive among the working circles and master units is the differing degree of bidder activity in each area, where bidder activity is identified by the average number of bidders qualified to bid on the timber sales. The relationship is positive, indicating that, where bidders are many, we may confidently expect a relatively high percent of total sales to be sold under competitive conditions.

For the west-side working circles, we have established that firm size in working circles is also important in explaining the degree of observed competition. We found that the greater the share of total volume acquired by large firms in given working circles, the lesser will be the percent sold competitively and the greater will be the percent sold noncompetitively.

For east-side working circles, we have found that, in addition to bidder numbers, the average cost of road construction is useful in explaining the degree of competition for timber sales. We found that, as road construction costs increase, the percent of total sale volume sold competitively decreases.

²¹ The standard deviation of percent competitive among east-side working circles is 30.85 percentage points. This may be compared with 18.40 percentage points for west-side working circles and 11.60 percentage points for west-side master units.

²² The regression equation is:

$$Y = 15.26 + \frac{114.52X_1}{(25.29)} - \frac{0.00035X_4}{(0.00017)}$$

DIFFERENCES IN COMPETITION BETWEEN INDIVIDUAL SALES

In the preceding section where analysis was based upon working circle and master unit data, aggregate variables were used in the form of percent competitive for sales and percent purchased by large firms. When the analysis is based upon individual sale data, obviously these aggregate variables are no longer available. A given sale is either single-bidder, token-bid, or competitive, and it is either purchased by a large firm or a firm not classified among the large operators. The dependent variable for our analysis based upon individual sale data will be the bid-appraisal ratio rather than the percent competitive. The appraised price is the base to this ratio. We have assumed that appraisal procedures are uniform for each agency within a region and that there was no major error in appraisal. Thus, the appraised price represents a common standard of value for stumpage. The ratio of bid price to appraised price thereby becomes a measure of the degree of competition for a given timber sale as well as a measure of the percent premium paid.

Our attempt to account mathematically for the observed variability in bid-appraisal ratios is limited by the variables that can be quantified from the historical record. We have selected the following nine factors that may be treated as independent variables and occupy a hypothetical relationship to the dependent variable, the bid-appraisal ratio:

1. Number of bidders that qualify to bid on any given timber sale.
2. Size class — large or small — of the successful bidder on each timber sale, where large firms are defined as the 20 largest lumber producers, the 20 largest plywood producers, and the eight largest timberland owners for west-side sales, and the eight largest lumber producers for east-side sales, as of the year 1960.
3. Road construction cost for each sale.

4. Total volume per sale.
5. Weighted average appraised price per thousand board feet.
6. Housing starts on a monthly, seasonally adjusted basis.
7. Douglas-fir lumber price index for west-side sales and ponderosa pine lumber price index for east-side sales.
8. Sale type — oral auction or sealed bid.
9. Time, identified by the month and year in which the sale was made.

In the following section the hypothetical relation of these variables to the bid-appraisal ratio will be explained.

Variables To Be Tested

1. There should be a positive relationship between the bid-appraisal ratio and the number of qualified bidders per sale. We know that, where only one bidder is qualified on a given sale, the bid-appraisal ratio will usually be 1.00. The occasional premium bid reflects a mistake in judgment by a single qualified bidder. In a Forest Service (but not Bureau of Land Management) oral-auction sale, a sealed bid must be submitted as part of the process of becoming a qualified bidder. Occasionally, a potential bidder will submit a qualified bid significantly in excess of the appraised price to demonstrate his determination to acquire the sale. If no other bidders become qualified, the sale is consummated at the sealed-bid price. When the number of qualified bidders are few but more than one, bid-appraisal ratio tends to increase sharply and, when bidders are many, the ratio continues to increase but at a decreasing rate. Thus, a logarithmic function will be used to represent the relationship between number of bidders and bid-appraisal ratio.

2. We would expect a negative relationship between the percent premium paid for Federal timber and the economic size class of the buyer. In the analysis based upon west-side working circle data, we found that, where large firms occupied an important position as timber buyers, the percent of total volume sold competitively tended to be low. This expected relationship is based upon the proposition that large firms possess relatively great market power, and that all other firms in their bidding practices show respect for the market power of larger firms. We will now examine the relationship between the premium on individual timber sales and the size class of the buyer.

3. A heavy road construction requirement would lead to fewer bidders in that the capital requirement and the risk attached to road construction would serve as barriers to entry. The greater the road construction requirement, the greater will be the financial burden on a bidder and the greater will be the risk arising out of an unknown error in the road construction appraisal. Small firms are not able to assume either burden, and hence one would expect fewer small-firm bidders on sales with high road construction requirements. If fewer bidders are qualified for high-cost sales, then we would find evidence of multicollinearity between road cost and number of bidders.

4. The bid-appraisal ratio should be negatively correlated with the size of a sale. Since the supporting argument is identical to that for the third variable, the fourth variable will be considered alternative to the third; i.e., if either the third or fourth variable is acceptable in either region, then the other variable is automatically rejected by the regression program. We expect to find a high degree of multicollinearity between road cost and average sale size.

5. The bid-appraisal ratio should be negatively associated with the weighted average appraised price per thousand board feet by sale. This variable is based upon the mathematical character of the bid-appraisal ratio itself. Since our dependent variable is a ratio, a constant absolute premium over appraised price will produce a relatively high ratio any time the denominator (appraised price) is relatively low. Where timber is of low value, due to a high road construction requirement or an unusually long log haul, or is underappraised and therefore has a relatively low denominator in the ratio, very high bid-appraisal

ratios may result. A bid-appraisal ratio of 3.00 or greater is relatively common for timber appraised at between \$2 and \$5 per thousand board feet. This result seldom occurs for timber appraised in excess of \$20 per thousand board feet. Because the appraised price offers an absolute floor for the bid value, we would expect the bid-appraisal ratio to decline rather sharply for initial increases in appraised price and to decline at a lower rate as higher appraised values are approached. Therefore, a curvilinear relationship should be expected. As in the instance of the number of bidders, we will again use a logarithmic transformation of the appraised price per thousand board feet.

6. The bid-appraisal ratio should be positively correlated with the level of housing starts. This relationship depends upon cyclical behavior. Unlike number of bidders, economic size class, road construction requirement, and sale size, housing starts are not likely to be affected by local Federal timber sale policy. If the variable enters the regression equation, it will simply contribute to the total explanation of observed differences in bid-appraisal ratio among individual timber sales.

7. The bid-appraisal ratio on individual sales should be positively correlated with variations in lumber prices. The relationship is similar to that advanced for housing starts. It rests on cyclical behavior. Multicollinearity would appear to be present between housing starts and lumber prices; hence, if one variable enters the equation, the other most likely will not. However, lumber prices may have an important degree of relationship independent of housing starts. The timing of lumber price variation is correlated with housing starts but is not identical to housing starts' behavior.

8. We would expect higher bid-appraisal ratios with sealed-bid sales and lower bid-appraisal ratios with oral-auction sales. The logical basis for this relationship is that sealed-bid sales inject a note of uncertainty into the bidding process. When a sealed bid is made, a bidder does not know who his competitors are, if any, and does not know how high a bid is necessary to obtain the sale. In contrast, many oral-auction sales are transacted at appraised price because the successful bidder knows he is the only bidder. In other oral-auction cases where two or more bidders are qualified and identified, only token bidding may take place. If all other sale characteristics are

constant, we would therefore expect that the uncertainty implicit in sealed-bid sales would result in higher premiums over appraised prices. However, we know that other factors are not constant. For example, sealed-bid sales tend to be substantially smaller than oral-auction sales. Also, small firms tend to buy a higher percent of sealed-bid sales than do the large firms. For purposes of this analysis, however, we will ignore these complications. In the hypotheses test concerned with sale type, oral-auction sales will be assigned the number 1; and sealed-bid sales, the number 2.

9. Finally, the bid-appraisal ratio may be correlated with the passage of time. If there is a persistent linear trend in bid-appraisal ratio, it will be identified by this variable.

We will now examine the effect of these variables on the bid-appraisal ratio, using the information we have developed for individual Forest Service and Bureau of Land Management timber sales.

West Side

FOREST SERVICE SALES.—Complete data for testing all nine hypotheses on Forest Service sales are available for the period 1959-62. Data on number of bidders per sale, road construction cost per sale, and sale type were not available before 1959.

Using stepwise multiple regression analysis on the relation between west-side bid-appraisal ratios and the nine independent variables, we find that the log of the number of bidders (X_1), size of purchaser (X_2), sale size (X_4), and the log of the appraised price per thousand board feet (X_5), enter the regression equation as explanatory variables.²³

The coefficient of multiple correlation for our resulting equation is $R = 0.60$. The coefficient of determination is $R^2 = 0.36$. Thus, 36 percent of the total variation in bid-appraisal ratios is accounted for by the four variables.

Even with the four variables included in our multiple regression equation, we find that the coefficient of determination is relatively low. This means that there were causal factors at work on the bid-appraisal ratio other than those which have been quantified and included in the equation. Several important nonquantifiable variables can be suggested; for example, one important determinant in the vigor of bidding in a given sale is the personality of each individual bidder and the human relationships existing between bidders. Thus, with an equal desire for given timber, a single bidder may bid vigorously on a given sale when opposed by A, who is regarded as an "outsider," but refrain from bidding entirely when opposed by B, who may be a neighbor and friend. Further, the degree of need for logs at a given point in time is also a determinant of the vigor of bidding. Perhaps the psychological attitude at the moment occasionally influences premium bidding over appraised price. One's personal assessment of future events, such as, for example, the probability of getting a future timber sale, may influence bidding at any given sale. Finally, the existence of "deals" among bidders will influence the vigor of bidding. Thus, we have not and cannot include all of the variables that determine the bidding outcome of a given sale. Our primary concern is not with fully accounting for all variability; rather, we are concerned with determining whether or not certain variables are related to the observed variation in bid-appraisal ratios. In particular, because this is a study of competition for Federal timber, we are vitally interested in the relationship of economic size of the successful bidder, X_2 , the importance of the number of qualified bidders, X_1 , and the importance of potential barriers to entry, such as the sale size, X_4 , and the road construction costs, X_3 .

Summarizing the foregoing analysis, we found that four variables are accepted for our explanation of competitive variability: the logarithm of the number of bidders, size class of buyer, sale size, and the logarithm of the appraised price per thousand board feet. The remaining five variables involving road construction cost, monthly housing starts, a lumber price index, sale type, and a time trend did not enter the equation.

²³ The regression equation is:

$$Y = 2.19 + \frac{0.8881X_1}{(0.0306)} + \frac{0.083X_2}{(0.028)} - \frac{0.00001X_4}{(0.000002)} - \frac{0.9569X_5}{(0.0402)}$$

BUREAU OF LAND MANAGEMENT SALES.—

Data are available for testing eight of the nine hypotheses for Bureau of Land Management sales over the entire 1951-62 timespan. Road construction cost information is not available. Since BLM sales are made in the same areas as Forest Service sales and are bid on and purchased by the same buyers, they should provide additional information on which to base conclusions.

The independent variables tested here are number of bidders expressed in logarithmic form (X_1), size class of successful bidder (X_2), sale size (X_3), appraised price per thousand board feet expressed in logarithmic form (X_4), housing starts (X_5), the price index of Douglas-fir lumber (X_6), sale type (X_7), and time (X_8).

Again using stepwise regression techniques on the relation between bid-appraisal ratios and the eight independent variables, we find that number of bidders (X_1), appraised price per thousand board feet (X_4), housing starts (X_5), the price index of Douglas-fir lumber (X_6), and sale type (X_7), enter the equation.²⁴

The coefficient of multiple correlation is $R = 0.67$, and the coefficient of determination, $R^2 = 0.45$. This means that we can account for 45 percent of the variation in the bid-appraisal ratio between sales with the five independent variables shown in the equation.

Two variables that entered the equation in the west-side Forest Service analysis but did not enter here are sale size and size class of successful bidder. We would expect sale size to be less important here since Bureau of Land Management sales were uniformly small relative to the large spread in Forest Service sale size.

The failure of firm size to enter the Bureau of Land Management regression equation may be due to the definition of the "big firm" category. This definition is based on 1959 production data for lumber and plywood firms and 1959 timber ownership. The Bureau of Land Management analysis extended back to 1951. About half of the 20 big lumber firms operating in the early

1950's had disappeared due to merger or closing by 1959 and therefore were not included in our definition of "big firms."²⁵ Conversely, about half of the firms in our definition were not large or were not in the timber market in the early 1950's.

East Side

As we shift to the pine region to continue the analysis, it should be made clear that the east side is economically different from the west side. Although the east side involves a considerably larger geographical area, the annual volume of National Forest timber sold is only about one-third that of the west side and the annual volume of Bureau of Land Management sales is less than 5 percent of the west-side volume. Bidder activity on the east side is much less intense. The average number of bidders for Forest Service sales during the 1959-62 period was 2.38 bidders per sale on the east side compared with 4.19 on the west side. Bureau of Land Management sales averaged 1.63 bidders on the east side and 2.43 on the west side during the 1951-62 period. Other evidence also indicates a lower degree of competition on the east side. The average premium over appraised price for all Forest Service east-side sales was only 26 percent compared with 40 percent on the west side. Bid prices for Bureau of Land Management sales averaged 16 percent more than appraisals on the east side and 33 percent more for west-side sales. Finally, east-side timber was of lower value. The average appraised price of all National Forest timber sold over the period studied was \$12.25 per thousand board feet on the east side, compared with \$20.11 on the west side. Bureau of Land Management east-side timber had an average appraised price of \$17.15 per thousand board feet, whereas west-side timber averaged \$21.41 per thousand board feet.

FOREST SERVICE SALES.—The logical relationships among the quantifiable variables are the same as previously stated for the west side. Therefore, the same nine hypotheses outlined for west-side Forest Service sales will be tested for east-side sales. Information in exactly the same form concerning the nine independent variables is available

²⁴ The regression equation is:

$$Y = 1.174 + 1.071X_1 - 0.852X_2 + 0.00017X_3 + 0.0069X_4 - 0.0895X_7 \\ (0.024) \quad (0.039) \quad (0.00004) \quad (0.0009) \quad (0.0195)$$

²⁵ See p. 50 in: Mead, Walter J. Mergers and economic concentration in the Douglas-fir lumber industry. U. S. D. A. Forest Serv. Res. Pap. PNW-9, 81 pp., illus. 1964.

for the east side. The lumber price index will be based on No. 3 ponderosa pine boards rather than Douglas-fir. Four variables entered the multiple regression equation: the log of the number of bidders (X_1), road cost (X_3), the log of the appraised price per thousand board feet (X_5), and the whole-sale lumber price index (X_7).²⁶

The coefficient of multiple correlation for the above equation is $R = 0.50$; the coefficient of multiple determination, $R^2 = 0.25$. Thus, only 25 percent of the total variability in the dependent variable is accounted for by the four independent variables.

The fact that a lumber price index entered the equation here but not on west-side Forest Service sales may be due to the greater homogeneity of buyers on the east side and their more direct contact with the lumber market. East-side bidders were, almost exclusively, lumber mill operators. In contrast, west-side buyers were a more heterogeneous group consisting of lumber mill operators, veneer mill operators, veneer-plywood operators, log exporters, loggers, and even a few pulpmill operators. For this group, lumber price would not always be the most relevant market indicator.

The most significant omission is economic size of the successful bidder. The rejection of this variable may be a result of a significant degree of multicollinearity between number of bidders, average road cost, and the economic size of the successful bidder. As a result, some of the relationship between economic size class of bidder and bid-appraisal ratio is accounted for by other variables that are present in the regression equation.

BUREAU OF LAND MANAGEMENT SALES.—The same eight hypotheses tested for Bureau of Land Management west-side sales will be examined here; data on road construction costs are not available. Sufficient information is available to examine all eight hypotheses over the entire 1951-62 period. The multiple regression equation for

these sales includes the log of the number of bidders (X_1), size class of successful bidder (X_2), and the log of the appraised price (X_4).²⁷

The coefficient of multiple correlation is $R = 0.72$, and the coefficient of determination, $R^2 = 0.52$, which means 52 percent of the total variability in the bid-appraisal ratio is accounted for by the three independent variables.

Two of these variables also entered the east-side Forest Service analysis. The most notable variable which did not appear in the equation is the lumber price index. We had expected this variable to be even more important on the east side than on the west side, since east-side buyers make up a more homogeneous group, characterized by lumber production.

Summary

It is important to distinguish between the present section, where we are concerned with the individual sale data, and the preceding section based upon working circle and master unit data. In the section where the analysis was based upon working circle and master unit data, we were testing hypotheses concerned with differences in the degree of competition between the working circles and master units. Our measure of degree of competition was the percent of total volume sold competitively.

In the present section, we are no longer analyzing data on an area basis but rather have based the analysis upon individual sales. For Forest Service sales on the west side, rather than operating with 43 working circles, we based the analysis upon the record of 2,588 individual timber sales. And for the east side, rather than working with 26 working circles, we based the analysis upon 1,275 individual sales. For Bureau of Land Management sales on the west side, the analysis has been based on 3,372 individual sales rather than 12 master units. In addition, we have

²⁶ The regression equation is:

$$Y = 0.88 + 1.0159X_1 - 0.0000007X_3 - 0.574X_5 + 0.0059X_7$$

(0.6706) (0.0000002) (0.066) (0.0025)

²⁷ The regression equation is:

$$Y = 1.33 + 1.012X_1 - 0.089X_2 - 0.267X_4$$

(0.083) (0.042) (0.063)

examined 162 individual sales on the east side where no analysis of master units could be made. On an individual sale basis, we have examined nine variables — eight for Bureau of Land Management sales — to explain the high variability in bid-appraisal ratio among the many individual sales, and we found important relationships for each region.

For both agencies, Forest Service and Bureau of Land Management, and for both the west side and the east side, we have established clear relationships between the logarithmic value of the number of bidders and the logarithmic value of the weighted average appraised price per thousand board feet and the dependent variable, the bid-appraisal ratio.

The other variables representing the market's structure — size class of successful bidder, sale size, and road construction cost — were not as uniformly important. Buyer size class was useful in explaining the bid-appraisal ratio for both west- and east-side Forest Service sales, but was important in explaining bid-appraisal ratio variability only for east-side Bureau of Land Management sales.

Sale size entered the regression equation for west-side Forest Service sales, whereas the relation between road construction cost and the bid-appraisal ratio proved important for Forest Service sales on the east side. It was of little importance which of these two variables entered the equation, since their logical relationship to the bid-appraisal ratio was the same and the two independent variables were closely related.

We also found some relationships between the bid-appraisal ratio and variables not associated with the market's structure. The Douglas-fir price index and the level of housing starts were important in explaining variations in the bid-appraisal ratio on the west-side Bureau of Land Management sales. On the east side, the price index of ponderosa pine No. 3 boards was an important variable when Forest Service sales were examined, but was not for Bureau of Land Management sales.

Of the remaining two independent variables tested, sale type and a time trend, only sale type appeared and then only once during the entire analysis. We had hypothesized that sealed-bid sales, which inject an additional degree of uncertainty into a sale, would command a higher premium over the appraised price. However, in the one analysis where sale type entered the equation (west-side Bureau of Land Management sales), the opposite result was found; sales sold under sealed bids brought a smaller percent premium over the appraisal.

Our analysis here contained two possible shortcomings. First, we examined all sales without regard to whether they were made in areas of strong competition or in areas where competition was weak. In areas where competition is strong, we should not expect to find a difference in bid-appraisal ratios as they relate to sale type. In fact, oral-auction sales may well have a higher ratio since sealed bids do not contain the emotional aspect of oral auctions. Where competition is weak, the uncertainty injected by sealed bidding should result in higher premiums over appraised prices than would be expected with oral-auction sales.

Second, the effect of sale type is highly related to the number of bidders. All oral-auction sales with only one bidder would be expected to sell at the appraised price. When sealed bids are used, a potential buyer does not know who his competitors are, and his bid should reflect this uncertainty. The number-of-bidders variable should, therefore, account for some of the variation resulting from sale type.

By taking account of these factors in an analysis of selected Forest Service working circles, Mead found a significantly higher ratio of bid price to appraised price for sealed-bid sales.²⁸

²⁸ Mead, Walter J. National resource disposal policy — oral auction versus sealed bids. *Natur. Resources J.* 7(2): 194-224, illus. 1967.

CONCLUSIONS AND RECOMMENDATIONS

We have found that, where there is competition for Federal timber, bid prices rise substantially above appraised prices. About 70 percent of the volume sold by the Forest Service in the Douglas-fir subregion was classed as competitive and the bid price on these sales exceeded the appraised price by 63 percent. Competitive sales made by the Bureau of Land Management on the west side also accounted for about 70 percent of the total volume; the bid price on these sales exceeded appraisals by 47 percent. On the east side, competitive sales made up 34 percent of total volume and competitive prices exceeded appraised price by 60 percent for Forest Service sales. Bureau of Land Management east-side competitive sales accounted for 40 percent of total sale volume and had bid prices that exceeded appraisals by 37 percent.

In specified areas where Federal timber sales are made — 43 west-side working circles, 26 east-side working circles, and 12 west-side master units — we found that the percent of total sale volume sold under competitive conditions varied directly with the average number of bidders per sale. In addition, in one analysis (west-side working circles), the size class of the successful bidder was found to be important in explaining the degree of sale competitiveness, and in another (east-side working circles), road construction costs proved to be important as a barrier to competitive bidding.

When examining individual sales, we found that certain specified structural variables were important in determining the extent to which bid prices exceeded appraisals. In every case, the number of bidders qualified to bid on each sale proved to be the most important variable in explaining the ratio between bid and appraised prices. The size class of the successful bidder was also important in explaining bid-appraisal ratios. We concluded that large firms are generally able to obtain Federal timber at a smaller premium over appraised price than that paid by small firms.

Two potential barriers to entry were examined

for their effect on bid prices: Sale size, and the amount of road construction required on a given sale. Sale size and road construction requirements — whichever appeared in the Forest Service sale analysis — had a negative effect on the bid-appraisal ratio; as sale size became larger and as road costs became higher, we could expect the ratio to decline.

The type of sale — sealed-bid or oral-auction — was important in explaining the size of the bid-appraisal ratio in only one of the analyses, west-side Bureau of Land Management sales. However, the appearance of this variable did not lend support to our hypothesis. The analysis showed that we could expect a lower premium over appraised price when sealed-bid rather than oral-auction sales are made, just the reverse of what we had hypothesized.

Two variables not related to the competitive structure of the Federal timber market were also examined, lumber price indexes and current level of housing starts. Lumber prices appeared more frequently than did housing starts in the final equations, but both variables showed some positive influence on the bid-appraisal ratio.

We can conclude from this study that important differences occur in the degree of competition (measured by bid price premium over the appraised price) between individual Federal timber sales and between specified areas where Federal timber sales are made. Part of these price differences can be explained by the structure of the timber-buying industry and the characteristics of the sales. The differences raise questions as to what constitutes a "reasonable price" for Federal timber buyers and for the public as owners of Federal timber resources.

There has been a long and continuing debate and disagreement concerning the question of a reasonable price for Federal timber. A discussion of a reasonable price must begin by clarifying the fact that there are several economic interests involved in this issue, each holding different con-

cepts of a reasonable price. Five separately identifiable economic groups may be listed:

1. Timber buyers and manufacturers of wood products. The lumber mill or veneer mill operator is interested in the lowest possible price for the Federal timber which he buys. His economic incentive is profit. The prices of his final products are determined in competitive markets over which he has no control. Variables over which he has some control include product mix and the costs of logging and manufacturing. His principal raw material cost is stumpage or log cost. It follows that the lower the cost of log input, the greater will be his profit or the lesser will be his loss. Those operators who are in highly competitive areas would be delighted to obtain Federal timber at the present appraised prices. At the other end of the competitive spectrum, those who obtain their timber with minimal or no competition write extensive reports addressed to the Federal agencies setting forth their case for lower appraised values. In either case, the timber buyer-processor has a strong economic interest arising out of the profit motive to lower the cost of public timber, and those who expect to obtain some of their timber at appraised price generally argue that present appraisals are too high.

2. Taxpayers and citizens who indirectly own the Federal timber. The taxpayer has not voiced his position to the same degree that the timber buyer has. Income from the sale of Federal timber is income in lieu of taxes. The greater the Federal revenue from the sales of timber, the lesser the need for taxes; and the lesser the revenue from timber sales, the greater the need for taxes. Taxpayer interest is broader than a Federal Government interest. County governments in which Federal timber is located receive a portion of the proceeds from timber sales. On these sales, after certain expenses, counties receive 25 percent of the sale proceeds from Forest Service sales and 50 percent from Bureau of Land Management sales.²⁹

3. Local business and labor interests. Within individual communities, local businessmen and labor have an interest in maintaining local industry. Sales and profits for local businessmen and jobs for labor are involved. A firm that is unable to compete profitably in the resource input and product output markets frequently takes its case to local business and labor organizations with the argument that lower appraised prices on Federal timber are needed to save jobs and markets. Within the last decade, a large number of old sawmills have been closed, sometimes bringing community hardships as a result. The argument can, therefore, be illustrated with a multitude of cases, and we frequently find community interests lined up with buyer interests in favor of lower appraised prices. The point should be made clear that lower appraised prices would benefit only those operators who obtain a significant volume of timber at appraised price. It would be of no benefit to producers in highly competitive areas who are currently paying premiums over the appraisal and in fact may place them at a further competitive disadvantage relative to producers in noncompetitive areas.

4. The General Accounting Office and the Bureau of the Budget of the Federal Government. The responsibility of these agencies is to insure that "fair value" is received in exchange for assets sold from public ownership. In practice, their emphasis has been to question whether a sufficiently high price has been received for public timber. As representatives of the broad rather than regional or community interest, they are lined up with the taxpayer interest on behalf of higher appraised values.

5. Agencies in charge of timber sales. These agencies are under legal obligation to appraise timber at its "fair market value," which is synonymous with the "market value" realized under competitive conditions. The agencies have been petitioned and questioned by both sides. The result has been the development of an extremely elaborate system of appraisal. The system starts with competitive markets in final products and subtracts all costs of processing where costs are estimated in detailed studies to arrive at an estimate of stumpage value with an allowance for processor profit.

²⁹ Counties are legally entitled to receive 75 percent of sale proceeds from Bureau of Land Management O&C sales, but they voluntarily contribute one-third (25 percent of the total) for development of O&C lands. Receipts from Bureau of Land Management sales on the public domain are split between the Bureau of Reclamation, which receives 95 percent, and the State where the timber is located, which receives the remaining 5 percent.

Economists have a view of what constitutes a "reasonable" price for timber resources or any other economic goods. The reasonable price is that price which is determined by buyers and sellers operating in competitive markets. The principal requirement for a competitive market is that there be a sufficient number of buyers and sellers in the market so that no single economic unit exerts a perceptible influence on the prices of the things it buys and sells. Two further conditions are that there are no monopolistic or institutional restraints and that all participants in the market are well informed.³⁰ To the extent that collusive agreements or monopolistic behavior on the part of buyers and sellers interferes with the market process, market prices will depart from competitive prices.

The results of this analysis suggest certain areas where modification of existing procedures may reduce stumpage price differences that arise because of differences in sale or market characteristics:

1. It may be possible to reduce an observed barrier to entry into the market for Federal timber by constructing all main-line logging roads into each given sale area prior to its sale. This would require that the timber-selling agencies contract to have roads constructed instead of requiring that the successful bidder construct specified roads. If the main-line logging roads were constructed prior to sale, the capital requirements would be lower, and additional firms would become eligible bidders. As a further benefit, eliminating the road construction requirement as a condition of sale would reduce an element of uncertainty associated with purchasing Federal timber. At present, the required road system is specified in the sale contract, and the construction cost is estimated but is not guaranteed. Bureau of Land Management sales require construction of the roads. Forest Service sales do not require the operator to build the roads, but it is generally necessary for removal of the timber. In both cases, all roads that are built must meet the specifications set down by the selling agency. Occasionally, the actual construction cost differs widely from the estimated cost. This factor increases uncertainty and acts as a further barrier to entry for small firms.

2. It may also be possible to reduce barriers to entry by avoiding the current practice of offering some very large sales. For Forest Service sales in the 1959-62 period, 31 percent of all volume sold on the west side and 53 percent of all east-side volume were transacted in sales of 15 million feet or larger. Our analysis showed some evidence that large Forest Service sales tended to be the least competitive.

Sale size was not significant in explaining variations in the bid-appraisal ratio for Bureau of Land Management sales. From 1951-62, only four west-side sales had volumes exceeding 15 million board feet and no east-side sales exceeded this volume.

Two justifications for large sales have commonly been offered. First, large sales have often been necessary to amortize heavy road construction costs. If the roads were constructed prior to a given sale, this justification for large sales would no longer hold. Second, large sales have been requested by the industry to assure a continued log supply which, in turn, would allow heavy capital investments for plant expansion and modernization. Specifically what is desired are long-term sales to permit the accumulation of a large reserve of timber under contract. Present sales policy allows firms to build some reserves of timber under contract. As of January 1, 1967, timber under contract from previous sales totaled slightly less than twice the allowable cut for Region 6. Smaller sales would generally mean shorter term sales and thus any benefits of long-term sales in the form of improved efficiency and better raw material utilization would be lost. Yet it appears that smaller sales during the period we have examined would have increased competition.

3. The sale type variable might receive further examination. Sale type — sealed bid or oral auction — did not prove significant in helping explain variations in the bid-appraisal ratio with the exception of the west-side BLM analysis. We had reasoned that the uncertainty associated with sealed bids should result in a higher ratio of bid price to appraised price; in the BLM analysis we obtained the opposite result.

As indicated earlier, when the analysis is limited to areas where competition is weak, and when the effect of number of bidders is eliminated, additional analysis of sale type has shown that sealed bidding produces a significantly higher premium over the appraised price.

³⁰ For a more thorough discussion of the nature of competition, see pp. 87-89 in: Stigler, George J. *The theory of price*. Ed. 3, 335 pp., illus. New York: The MacMillan Co. 1966.

4. In view of the large differences observed between competitive and noncompetitive sales throughout Washington and Oregon, the appraisal policy should be reexamined in light of its objective of approximating a "fair market value." We have seen that, for Forest Service sales where competition determined the price, the weighted average high bid exceeded the appraised value by 63 percent on the west side and 60 percent on the east side. Also, an analysis of the 1964-66 record shows that these discrepancies between bid and appraised prices have increased to 100 percent and 63 percent, respectively. For Bureau of Land Management sales the weighted average high bid exceeded the appraisal on competitive sales by 47 percent

on the west side and 37 percent on the east side. In the 1964-66 period the difference increased to 75 percent on the west side and declined to 19 percent on the east side where only a small number of sales are made. It appears from this evidence that appraisals may be falling short of the fair market value goal. Where competition is weak and timber is consequently sold at the appraised price, the public owners may not be receiving a fair market value for timber. A reexamination of the appraisal methods and procedures may be necessary to narrow the discrepancy between the selling agency valuation and the market valuation of publicly owned timber.

APPENDIX A

Tables of National Forest Sales Data

Table 13.—Sale data by Forest Service working circle, total west side, 1959-62

Kind of sale and working circle	Number of sales	Average number of bidders per sale	Volume	Percent of total volume sold	Average sale size	M. bd. ft.		Weighted average appraised price	Weighted average bid-appraisal ratio	Percent of sales requiring road construction	Average road construction cost for sales requiring construction
						M. bd. ft.	Dollars				Dollars
One-bidder sales:											
Solduck	3	1.00	540	0.2	180		33.69	1.00		33.3	200
Quilcene	6	1.00	11,730	5.4	1,955		12.31	1.00		83.3	27,667
Quinalt	17	1.00	89,459	27.5	5,262		6.25	1.00		64.7	75,407
Shelton	7	1.00	173,260	91.5	24,751		19.91	1.00		100.0	237,942
Glacier	4	1.00	14,340	13.5	3,585		15.14	1.00		75.0	39,413
Skagit	3	1.00	24,040	24.3	8,013		2.53	1.00			
Baker River	1	1.00	92	0.1	92		34.83	1.00			
South Fork Stillaguamish	1	1.00	11,750	8.5	5,875		3.81	1.00		100.0	77,698
Skykomish	2	1.00	21,750	16.6	7,250		5.93	1.00		33.3	337,760
Snoqualmie	1	1.00	9,900	21.3	9,900		17.48	1.00		100.0	77,180
Green River	1	1.00	1,080	4.0	1,080		15.30	1.00		100.0	4,420
White River	2	1.00	3,755	3.2	1,878		6.69	1.00		50.0	12,035
Mineral	8	1.00	90,600	66.5	11,325		14.43	1.00		100.0	84,212
Packwood	13	1.00	54,925	20.5	4,225		15.08	1.00		84.6	49,722
Randle	4	1.00	1,670	0.4	418		16.07	1.00		50.0	100
Spirit Lake	5	1.00	41,625	33.7	8,325		12.44	1.00		60.0	169,647
Lewis River	1	1.00	900	0.2	900		23.84	1.00			
Mt. Adams	23	1.00	153,840	39.6	6,689		13.27	1.00		87.0	54,788
Wind River	11	1.00	4,385	1.9	399		24.62	1.00		45.5	1,855
Canyon Creek	4	1.00	5,300	4.6	1,375		15.72	1.00		50.0	21,306
Hood River	1	1.00	100	0.1	100		21.26	1.00			
Clackamas-Sandy	11	1.00	17,110	1.7	1,555		8.65	1.00		45.5	13,845
Hebo	10	1.00	19,569	7.4	1,957		13.80	1.00		70.0	10,260
Waldport	14	1.00	18,435	4.3	1,317		19.23	1.00		57.1	37,984
Mapleton	42	1.00	83,362	16.6	1,985		24.56	1.00		45.2	37,941
North Santiam	9	1.00	15,040	5.0	1,671		18.98	1.00		77.8	12,328
South Santiam	38	1.00	75,999	20.7	2,000		20.40	1.00		52.6	23,402
McKenzie	27	1.00	18,910	3.8	700		24.62	1.00		48.1	8,028
Lowell	10	1.00	18,670	4.8	1,867		19.07	1.00		60.0	27,130
Oakridge	36	1.00	111,896	13.6	3,108		14.43	1.00		66.7	52,372
Cottage Grove	11	1.00	64,600	31.4	5,873		25.63	1.00		90.9	40,535
North Umpqua	20	1.00	29,336	3.6	1,467		25.82	1.00		55.0	12,985
South Umpqua	18	1.00	10,694	2.7	594		19.74	1.00		35.3	11,989
Coquille	13	1.00	38,220	35.5	2,940		20.95	1.00		61.5	66,994
Rogue River (Siskiyou NF)	9	1.00	20,097	7.0	2,233		13.87	1.00		55.6	53,130
Checo	9	1.00	26,940	20.6	2,993		18.25	1.00		100.0	50,542
Josephine	11	1.00	14,617	6.4	1,329		12.52	1.00		45.5	37,846
Applegate	2	1.00	10,980	12.9	5,490		6.39	1.00		100.0	62,698
Ashland	6	1.00	13,010	16.2	2,168		15.24	1.00		33.3	72,364
Rogue River (Rogue River NF)	3	1.00	22,490	8.4	7,497		14.21	1.00		66.7	87,166
All working circles — west side	419	1.00	1,345,216	11.6	3,219		16.24	1.00		60.5	46,524
All working circles except Shelton	412	1.00	1,171,956	10.3	2,852		15.69	1.00		59.9	41,077

Table 13.—Sale data by Forest Service working circle, total west side, 1959-62 (Continued)

Kind of sale and working circle	Number of sales	Average number of bidders per sale	Volume	Percent of total volume sold	M bd. ft.		Average sale size	Weighted average appraised price	Weighted average bid-appraisal ratio	Percent of sales requiring road construction	Dollars	
					M bd. ft.	Dollars					Dollars	
Taken-bid sales:												
Saleduke	4	2.25	38,600	17.5		9,650	18.95	1.00	100.0		93,460	
Quilcene	4	3.25	26,050	12.0		6,513	12.91	1.00	100.0		66,247	
Quinalt	9	2.56	89,728	27.6		9,970	6.75	1.00	88.9		114,003	
Shelton	1	2.00	16,000	8.5		16,000	20.43	1.00	100.0		122,560	
Glacier	2	2.00	615	0.6		308	22.55	1.00	100.0		3,477	
Skagit	2	2.00	1,600	1.6		800	8.45	1.00	100.0		7,018	
Baker River	3	5.33	6,020	4.6		2,007	5.88	1.00	100.0		18,574	
Suitttle	2	4.00	850	1.1		425	13.09	1.00	50.0		5,610	
Darrington	9	7.44	64,438	26.8		7,160	6.49	1.00	88.9		74,452	
South Fork Stillaguamish	5	4.80	26,700	19.3		5,340	5.67	1.00	100.0		60,355	
Skykamish	7	3.14	53,630	41.0		7,661	14.28	1.00	42.9		93,150	
White River	4	2.75	47,755	4.1		1,189	11.09	1.00	75.0		10,219	
Mineral	1	2.00	7,000	5.1		7,000	14.53	1.00	100.0		9,700	
Packwood	8	2.50	52,600	19.6		6,575	11.87	1.00	87.5		60,431	
Randle	2	3.86	88,300	23.5		12,614	8.31	1.00	100.0		126,333	
Spirit Lake	7	2.29	10,440	8.4		5,220	12.66	1.00	100.0		28,690	
Mt. Adams	2	2.50	47,150	12.1		6,736	14.56	1.00	50.0		66,271	
Wind River	2	2.50	11,750	5.0		5,875	17.43	1.00	100.0		70,424	
Canyon Creek	11	2.73	52,572	9.3		5,500	11.92	1.00	63.6		55,042	
Clackamas-Sandy	17	2.94	59,880	5.2		4,779	16.29	1.00	88.2		23,857	
Hebo	10	2.90	60,265	22.7		6,026	23.81	1.00	100.0		42,450	
Waldport	17	3.11	180,968	36.0		5,279	24.56	1.00	79.4		61,864	
Mapleton	34	3.11	73,310	24.2		3,858	13.08	1.00	73.7		38,739	
North Santiam	19	2.82	83,190	22.7		4,894	20.93	1.00	70.6		48,540	
South Santiam	17	3.25	26,065	5.2		3,258	29.21	1.00	25.0		20,429	
McKenzie	8	4.14	29,660	7.6		5,123	31.09	1.00	57.1		39,271	
Lowell	6	2.46	158,915	19.3		6,896	17.78	1.00	66.7		127,584	
Oakridge	23	2.18	21,250	10.3		1,932	27.55	1.00	27.3		23,646	
Cottage Grove	11	3.54	270,015	33.6		10,801	14.56	1.00	80.8		118,144	
North Umpqua	26	3.62	65,850	16.5		4,390	14.84	1.00	68.8		45,536	
South Umpqua	16	2.50	85,120	15.2		4,086	30.39	1.00	50.0		78,881	
Coquille	4	2.70	32,205	29.7		8,512	13.01	1.00	100.0		130,626	
Rogue River (Siskiyou NF)	10	2.63	57,155	24.6		3,572	20.13	1.00	83.3		95,055	
Chetco	6	2.00	32,205	25.1		3,572	14.96	1.00	62.5		60,242	
Josephine	16	2.63	57,155	36.1		4,382	8.30	1.00	85.7		60,311	
Applegate	7	2.43	30,675	21.4		2,865	18.78	1.00	100.0		130,654	
Ashland	6	2.50	17,190	42.5		6,841	15.18	1.00	50.0		55,865	
Butte Falls	7	3.71	47,890	42.5		6,841	14.23	1.00	66.7		33,499	
Rogue River (Rogue River NF)	6	3.50	26,840	10.0		4,473						
All working circles — west side												
All working circles except Shelton												
341												
340												

Table 13.—Sale data by Forest Service working circle, total west side, 1959-62 (Continued)

Kind of sale and working circle	Number of sales	Average number of bidders per sale	Volume	Percent of total volume sold	Average sale size	Weighted average appraisal ratio	Percent of sales requiring road construction	Average road construction cost for sales requiring construction
						M bd. ft.		
Competitive sales:								
Soleduck	25	4.88	182,435	82.3	7,297	13.15	1.34	68,019
Quilcene	22	4.86	178,670	82.6	8,121	14.87	1.40	90,002
Quinalt	20	3.30	145,955	44.9	7,298	8.73	1.29	70,729
Glacier	22	4.59	91,437	85.9	4,156	6.34	3.31	49,831
Skagit	10	10.60	73,190	74.1	7,319	4.07	3.07	91,186
Baker River	20	7.45	124,560	95.3	6,228	6.14	3.27	61,054
Suittale	19	11.68	74,205	98.9	3,906	11.67	1.66	47,844
Darrington	41	12.05	175,740	73.2	4,286	10.33	2.56	45,807
Stillaguamish	18	4.67	100,100	72.2	5,561	6.43	1.59	57,382
Skykomish	10	3.64	55,285	42.4	5,528	10.88	1.35	43,367
Snoqualmie	6	4.00	36,558	78.7	6,093	17.70	1.87	66,779
Cedar River	2	3.00	7,360	100.0	3,680	15.08	1.32	14,960
Green River	3	3.00	26,000	96.0	8,667	10.74	1.19	99,090
White River	24	4.17	107,345	92.7	4,473	15.44	1.43	43,226
Mineral	6	5.83	38,660	28.4	6,443	20.69	1.61	21,482
Packwood	41	5.32	160,915	59.9	3,925	13.79	1.50	41,190
Randle	56	7.00	285,900	76.1	5,105	16.34	1.95	57,232
Spirit Lake	8	4.25	71,550	57.9	8,944	14.76	2.07	85,047
Lewis River	30	5.17	406,045	99.8	13,535	15.34	1.57	104,856
Mt. Adams	42	3.31	187,395	48.3	4,462	16.41	1.48	56,464
Wind River	33	3.85	219,400	93.1	6,648	16.72	1.76	64,325
Canyon Creek	21	5.05	102,050	86.1	4,860	13.24	1.32	84,723
Hood River	28	3.25	143,395	99.9	5,121	25.26	1.32	35,330
Clackamas-Sandy	160	5.97	948,148	93.1	5,926	15.30	1.86	70,611
Hebo	39	4.87	184,201	69.9	4,723	16.73	1.52	74,4
Waldport	63	5.48	356,164	81.8	5,653	24.55	1.51	51,467
Mapleton	37	3.89	238,301	47.4	6,441	23.61	1.35	42,609
North Santiam	39	4.67	214,730	70.8	5,506	18.11	1.49	75,110
South Santiam	45	3.71	207,300	56.6	4,607	21.34	1.35	74,725
McKenzie	105	4.82	451,677	91.0	4,302	20.22	1.52	38,299
Lowell	62	6.32	339,955	87.6	5,383	23.73	1.57	65,847
Oakridge	102	4.29	553,350	67.1	4,302	21.13	1.43	59,869
Cottage Grove	36	3.58	119,700	58.3	3,325	16.88	1.54	77,978
North Umpqua	108	5.32	503,420	80.8	4,661	18.17	1.39	41,796
South Umpqua	66	6.02	322,686	62.8	4,661	18.17	1.39	62,775
Coquille	12	3.42	52,985	49.3	4,415	18.26	1.40	57,162
Rogue River (Siskiyou NF)	28	4.71	181,730	63.3	6,490	18.57	1.67	81,319
Chetco	12	3.25	171,600	54.8	5,967	18.17	1.44	55,035
Josephine	60	4.00	155,850	68.5	2,598	19.25	1.73	49,627
Applegate	10	3.50	43,220	51.0	4,322	12.65	1.98	32,158
Ashland	13	4.15	50,145	62.4	3,857	10.94	1.44	49,797
Bute Falls	23	5.26	64,715	57.5	2,814	17.70	1.30	19,195
Rogue River (Rogue River NF)	61	5.97	219,380	81.6	3,596	16.65	1.42	40,344
All working circles — west side								
All working circles except Shelton								

Table 13.—Sale data by Forest Service working circle, total west side, 1959-62 (Continued)

Kind of sale and working circle	Number of sales	Average number of bidders per sale	Volume	Percent of total volume sold	M bd. ft.		Average sale size	Weighted average appraised price	Weighted average bid- appraisal ratio	Percent of sales requiring road construction	Average road construction cost for sales requiring construction
					M bd. ft.						
All sales:											
Soleduck	32	4.19	221,575			6,924	14.21	1.28	87.5		69,232
Quilcene	32	3.94	216,450			6,764	14.49	1.33	96.9		76,883
Guinault	46	2.30	325,142			7,068	7.50	1.13	76.1		82,090
Shelton	8	1.13	189,260			23,685	19.96	1.00	100.0		223,519
Glacier	28	3.89	106,392			3,800	7.62	2.99	89.3		44,873
Skagit	15	7.53	98,830			6,589	3.77	2.53	73.3		75,882
Baker River	24	6.92	130,672			5,445	6.15	3.16	91.7		55,262
Suittelle	21	10.95	75,055			3,574	11.69	1.65	71.4		45,029
Darrington	50	11.22	240,178			4,804	9.30	2.14	84.0		51,263
South Fork Stillaguamish	25	4.40	138,550			5,542	6.06	1.42	100.0		59,602
Skykomish	20	3.10	130,665			6,533	11.44	1.14	60.0		80,346
Snoqualmie	7	3.57	46,458			6,637	17.66	1.69	85.7		68,512
Cedar River	2	3.00	7,360			3,680	15.08	1.32	100.0		14,960
Green River	4	2.50	27,080			6,770	10.92	1.18	50.0		51,755
White River	30	4.43	115,855			3,862	14.98	1.40	66.7		36,715
Mineral	15	3.00	136,260			9,084	16.21	1.17	80.0		62,318
Packwood	62	4.05	268,440			4,330	13.68	1.30	77.4		45,951
Randle	67	6.31	375,870			5,610	14.45	1.73	70.1		45,092
Spirit Lake	15	2.93	123,615			8,241	13.80	1.62	66.7		99,156
Lewis River	31	5.03	404,945			13,127	15.36	1.57	90.3		104,856
Wt. Adams	72	2.77	388,385			5,394	14.20	1.23	73.6		56,942
Wind River	46	3.11	235,535			4,391	16.76	1.71	65.2		54,116
Canyon Creek	27	4.26	118,560			5,120	13.74	1.76	66.7		74,379
Hood River	29	3.17	145,495			4,948	25.26	1.32	75.9		35,330
Blackamas-Sandy	182	5.47	1,017,830			5,592	15.01	1.80	69.2		67,472
Hebo	66	3.79	283,650			3,995	16.41	1.36	77.3		37,690
Waldport	87	4.49	434,864			4,998	24.22	1.41	83.9		39,340
Mapleton	113	2.42	502,631			4,448	24.11	1.17	66.4		60,925
North Santiam	67	3.73	303,080			4,524	16.94	1.34	71.6		55,130
South Santiam	100	2.53	366,489			3,665	21.05	1.20	67.0		35,686
McKenzie	140	3.99	496,652			3,548	20.86	1.47	51.4		54,146
Lowell	79	5.46	388,285			4,915	24.18	1.50	72.2		54,977
Oakridge	162	3.29	824,161			5,087	19.55	1.28	64.8		79,684
Cottage Grove	58	2.83	205,550			3,544	20.73	1.32	67.2		40,076
North Umpqua	153	4.56	802,771			5,247	17.25	1.24	62.1		69,249
South Umpqua	99	4.77	399,230			4,033	17.73	1.32	68.7		51,290
Coquille	29	2.21	107,550			3,709	21.24	1.18	65.5		64,458
Rogue River (Siskiyou NF)	47	3.57	286,947			6,105	16.59	1.42	78.7		90,836
Chetco	27	2.22	130,745			4,842	18.67	1.24	96.3		61,176
Josephine	87	3.37	227,622			2,616	17.74	1.50	55.2		50,611
Applegate	19	2.84	84,875			4,467	10.26	1.50	94.7		44,936
Ashland	25	3.00	80,345			3,214	13.31	1.28	56.0		70,347
Butte Falls	30	4.90	112,605			3,754	16.63	1.17	80.0		29,891
Rogue River (Rogue River NF)	70	5.54	268,710			3,839	16.20	1.35	52.9		42,135
All working circles — west side	2,348	4.19	11,571,209			4,936	16.80	1.45	70.3		59,424
All working circles except Shelton	2,340	4.20	11,381,949			4,872	16.75	1.46	70.2		58,625

Table 14.—Sale data by Forest Service working circle, total east side, 1959-62

Kind of sale and working circle	Number of sales	Average number of bidders per sale	Volume	Percent of total volume sold	Average sale size	Weighted average appraisal price	Weighted average bid-ratio	Percent of sales requiring road construction	Average road construction cost for sales requiring construction
			M bd. ft.		M bd. ft.	Dollars			Dollars
One-bidder sales:									
Okanogan	26	1.00	153,362	70.8	5,899	6.94	1.00	84.6	50,646
Entiat	6	1.00	46,710	84.0	7,785	7.82	1.00	100.0	24,188
Wenatchee	2	1.00	12,370	8.9	6,123	8.04	1.00	100.0	95,198
Ellensburg	1	1.00	5,000	3.1	5,000	7.56	1.00	100.0	37,202
Naches Tieton	9	1.00	65,210	34.5	7,246	10.43	1.00	100.0	77,991
East Side	8	1.00	35,760	24.5	4,470	10.43	1.00	100.0	75,015
West Klamath	6	1.00	21,700	10.9	3,567	11.97	1.00	87.3	26,306
Lakeview	26	1.00	153,789	94.6	5,992	11.97	1.00	96.7	26,446
East Klamath	12	1.00	126,806	97.7	5,992	11.97	1.00	73.1	33,993
Deschutes Plateau	20	1.00	184,081	36.1	7,204	22.66	1.00	66.7	11,316
Crooked River	22	1.00	40,005	13.3	1,818	18.45	1.00	65.0	62,311
Burns	29	1.00	235,903	76.1	8,824	13.92	1.00	50.0	13,556
John Day	12	1.00	43,710	22.3	3,643	9.46	1.00	75.9	68,914
Middle Fork	5	1.00	54,826	100.0	18,275	15.21	1.00	91.7	39,538
Burnt River	7	1.00	50,838	76.7	7,263	9.70	1.00	100.0	110,985
Elkhorn	9	1.00	61,941	43.5	6,882	9.60	1.00	100.0	52,033
Heppner	1	1.00	4,000	7.4	4,000	10.84	1.00	88.9	45,810
Pendleton Pilot Rock	7	1.00	26,734	14.9	3,819	6.67	1.00	57.1	9,055
Grande Ronde (Wallowa-Whitman)	1	1.00	1,240	1.7	1,240	4.27	1.00	100.0	2,852
Union	1	1.00	6,400	8.7	6,400	6.08	1.00	100.0	41,682
Pine	1	1.00	1,300	5.3	1,300	9.97	1.00	100.0	702
Wallowa	5	1.00	18,475	20.1	3,695	8.92	1.00	80.0	24,881
Winema	4	1.00	9,920	19.6	2,480	10.69	1.00	100.0	6,434
Chelan	4	1.00	35,100	100.0	8,775	10.02	1.00	100.0	84,758
All working circles — East side									
	223	1.00	1,316,880	35.25	5,932	12.53	1.00	76.7	45,146
Token-bid sales									
Okanogan	2	3.00	2,527	1.2	1,264	4.87	1.00	100.0	2,396
Entiat	1	2.00	8,900	16.0	8,900	6.45	1.00	100.0	24,188
Wenatchee	15	2.00	119,300	86.0	8,093	13.26	1.00	100.0	77,717
Ellensburg	7	3.43	13,400	8.3	1,914	12.02	1.00	100.0	11,980
Naches Tieton	7	2.17	102,650	54.3	14,664	7.94	1.00	100.0	115,740
East Side	9	2.89	37,730	25.8	4,192	8.65	1.00	100.0	22,273
West Klamath	2	2.50	11,800	6.0	5,900	17.67	1.00	100.0	23,624
Lakeview	1	2.00	1,950	1.2	1,950	28.85	1.00	100.0	3,510
East Klamath	3	2.33	24,764	9.0	8,255	21.13	1.00	100.0	47,994
Deschutes Plateau	12	2.25	141,765	27.8	11,814	18.48	1.00	83.3	58,759
Crooked River	13	2.38	191,445	73.2	14,727	14.94	1.00	61.5	185,652
Burns	5	2.20	60,441	18.0	12,088	9.71	1.00	100.0	109,940
John Day	11	2.36	117,970	60.2	10,725	9.04	1.00	90.9	82,885
Burnt River	1	3.00	7,300	11.0	7,300	12.59	1.00	100.0	57,664
Elkhorn	7	2.71	43,783	32.1	6,255	10.01	1.00	85.7	33,581
Heppner	3	2.33	32,539	60.0	10,846	10.60	1.00	66.7	96,564
Pendleton Pilot Rock	5	2.80	48,860	27.3	9,772	13.49	1.00	60.0	81,424
Grande Ronde (Wallowa-Whitman)	2	2.00	34,470	47.2	17,235	2.77	1.00	100.0	83,882
Union	4	3.00	66,930	91.3	16,733	8.59	1.00	100.0	83,360
Pine	1	4.00	23,000	7.70	7,700	11.00	1.00	100.0	187,260
Wallowa	5	2.20	62,870	68.3	12,574	11.00	1.00	100.0	71,766
Grande Ronde (Umatilla)	1	2.00	5,600	9.6	5,600	10.73	1.00	100.0	11,322
Clearwater	1	2.00	12,600	42.4	12,600	7.57	1.00	100.0	95,140
Winema	1	2.00	9,700	19.2	9,700	9.05	1.00	100.0	74,906
All working circles — east side									
	117	2.46	1,150,294	30.7	9,832	12.19	1.00	89.7	71,965

Table 14.—Sale data by Forest Service working circle, total east side, 1959-62 (Continued)

Kind of sale and working circle	Number of sales	Average number of bidders per sale	Volume	Percent of total volume sold	Average sale size	Weighted average appraised price	Weighted average bid-appraisal ratio	Percent of sales requiring road construction	Average road construction cost for sales requiring road construction	
									M bd. ft.	Dollars
Competitive sales										
Okanogan	13	3.00	60,680	28.0	4,668	5.31	1.94	100.0	19,654	
Wenatchee	3	3.33	7,000	5.1	2,333	7.11	2.00	100.0	13,323	
Ellensburg	34	4.79	143,220	88.6	4,212	10.14	1.49	97.1	29,832	
Naches Tieton	5	2.40	21,180	11.2	4,236	4.77	3.13	100.0	48,404	
East Side	15	4.93	72,500	49.7	4,833	9.44	2.47	93.3	26,362	
West Klamath	30	4.47	163,825	83.1	5,461	16.24	1.72	66.7	42,965	
Lakeview	5	2.60	6,893	4.2	1,379	15.84	1.26	80.0	3,390	
East Klamath	29	3.21	223,370	81.3	7,702	17.47	1.30	82.8	38,694	
Deschutes Plateau	36	3.19	184,530	36.1	5,126	13.54	1.53	61.1	31,251	
Crooked River	16	2.88	30,245	11.5	1,890	6.77	1.57	43.8	7,108	
Burns	3	3.00	19,820	5.9	6,607	15.71	1.03	100.0	56,250	
John Day	9	3.00	34,155	17.5	3,795	13.42	1.28	100.0	28,508	
Burnt River	1	3.00	8,140	12.3	8,140	8.78	1.78	100.0	72,393	
Elkhorn	4	2.75	30,570	22.4	7,643	1.53	1.16	100.0	31,117	
Heppner	1	2.00	17,700	32.6	17,700	9.77	1.60	100.0	73,445	
Pendleton Pilot Rock	17	3.71	103,635	57.8	6,096	7.41	1.58	82.4	29,644	
Grande Ronde (Wallowa-Whitman)	4	3.00	37,331	51.1	9,333	5.29	1.70	75.0	70,913	
Wallowa	6	2.50	10,635	11.6	1,773	6.66	1.50	83.3	11,724	
Grande Ronde (Umatilla)	7	3.57	52,976	90.4	7,568	12.20	1.78	71.4	47,834	
Clearwater	2	2.50	17,100	57.6	8,550	8.98	1.25	100.0	34,872	
Winema	14	2.50	30,905	61.2	2,208	10.93	1.16	78.6	4,098	
All working circles — east side										
	255	3.56	1,276,410	34.1	5,017	11.92	1.60	80.0	30,447	
All sales:										
Okanogan	41	1.73	216,569		5,282	6.46	1.26	90.2	37,149	
Entiat	7	1.14	55,610		7,944	7.60	1.00	100.0	59,340	
Wenatchee	20	2.05	138,670		6,934	12.26	1.05	100.0	61,980	
Ellensburg	42	4.48	161,620		3,848	10.21	1.44	97.6	26,495	
Naches Tieton	21	1.68	189,040		9,949	7.74	1.24	90.5	84,139	
East Side	32	3.38	145,990		4,562	9.03	1.73	93.8	25,589	
West Klamath	38	3.82	197,025		5,185	15.86	1.60	68.4	38,936	
Lakeview	32	1.28	164,632		5,145	16.83	1.01	75.0	27,622	
East Klamath	44	2.55	274,940		6,249	18.31	1.25	79.5	33,233	
Deschutes Plateau	68	2.38	510,376		7,506	16.69	1.19	66.2	46,337	
Crooked River	51	1.94	261,695		5,131	13.84	1.07	51.0	64,772	
Burns	37	1.32	336,164		9,086	12.53	1.05	81.1	74,485	
John Day	32	2.03	195,835		6,120	9.90	1.00	93.8	50,678	
Middle Fork	3	1.00	54,826		18,275	15.21	1.00	100.0	110,985	
Burnt River	9	1.44	66,278		7,364	9.91	1.10	100.0	54,921	
Elkhorn	20	1.95	136,294		6,815	7.92	1.04	90.0	38,468	
Heppner	5	2.00	54,239		10,848	10.35	1.20	60.0	88,857	
Pendleton Pilot Rock	29	2.90	179,229		6,180	8.96	1.33	72.4	33,119	
Grande Ronde (Wallowa-Whitman)	7	2.43	73,041		10,434	4.08	1.36	85.7	63,892	
Union	5	2.60	73,330		14,666	8.37	1.00	100.0	75,024	
Pine	2	2.50	24,300		12,150	7.82	1.00	100.0	93,981	
Wallowa	16	1.94	91,980		5,749	10.08	1.06	87.5	36,927	
Grande Ronde (Umatilla)	8	3.38	58,576		7,322	12.06	1.71	75.0	41,749	
Clearwater	3	2.33	29,700		9,900	8.38	1.15	100.0	54,961	
Winema	19	2.16	50,525		2,659	10.52	1.10	84.2	9,107	
Chelan	4	1.00	35,100		8,775	10.02	1.00	100.0	84,758	
All working circles — east side										
	595	2.39	3,775,584		6,307	12.22	1.20	80.7	44,766	

Table 15.—Sale characteristics by volume size classes for all oral-auction National Forest timber sales, west side (excepting Shelton Working Circle), 1959-62

Volume size class	Competitive class ¹	Number of sales	Percent of sales in competitive class	Total number of bidders	Average number of bidders	Total volume sold	Percent size class	Weighted average bid-appraisal ratio av. = WBR/vol.
M. bd. ft.								
Less than 1 million feet	1	251	29.6	251	1.00	85,951	25.4	1.00
	2	95	11.3	247	2.57	36,541	10.8	1.00
	3	502	59.1	2,251	4.48	215,668	63.8	1.50
Totals, or average by class		849	100.0	2,749	3.24	338,160	100.0	1.32
Percent of all sales by class		36.3	--	--	--	3.0	--	--
1-4.9 million feet	1	85	12.9	85	1.00	205,030	12.6	1.00
	2	95	14.4	293	3.08	236,475	14.5	1.00
	3	478	72.7	2,693	5.63	1,187,756	72.9	1.59
Totals, or average by class		658	100.0	3,071	4.67	1,629,261	100.0	1.43
Percent of all sales by class		28.1	--	--	--	14.3	--	--
5-9.9 million feet	1	47	9.6	47	1.00	339,000	9.4	1.00
	2	83	17.0	276	3.33	633,170	17.5	1.00
	3	359	73.4	2,003	5.58	2,646,080	73.1	1.66
Totals, or average by class		489	100.0	2,326	4.76	3,618,250	100.0	1.48
Percent of all sales by class		20.9	--	--	--	31.8	--	--
10-14.9 million feet	1	13	7.1	13	1.00	164,000	7.4	1.00
	2	36	19.8	115	3.19	419,000	18.8	1.00
	3	133	73.1	753	5.66	1,639,270	73.8	1.71
Totals, or average by class		182	100.0	881	4.84	2,222,270	100.0	1.52
Percent of all sales by class		7.8	--	--	--	19.5	--	--
15 million feet or more	1	17	10.5	17	1.00	378,900	10.6	1.00
	2	30	18.5	107	3.57	624,200	17.5	1.00
	3	115	71.0	682	5.93	2,570,908	71.9	1.60
Totals, or average by class		162	100.0	806	4.98	3,574,008	100.0	1.43
Percent of all sales by class		6.9	--	--	--	31.4	--	--
Total or average, all sales		2,340		9,833	4.20	11,381,949		1.46

¹ The three competitive classes are defined as follows:

1. One bidder, bid-appraisal ratio = 1.00
2. Token bid (two or more bidders, bid-appraisal ratio = 1.00)
3. Two or more bidders, bid-appraisal ratio greater than 1.00 rounded to nearest 0.01.

Table 16.—Sale characteristics by volume size classes for all oral-auction National Forest timber sales, east side, 1959-62

Volume size class	Competitive class ¹	Number of sales	Percent of sales in competitive class	Total number of bidders	Average number of bidders	Total volume sold	Percent size class	Weighted average bid-appraisal ratio av. = WBR/vol.
M. bd. ft.								
Less than 1 million feet	1	91	50.3	91	1.00	38,705	49.2	1.00
	2	19	10.5	47	2.47	8,206	10.4	1.00
	3	71	39.2	240	3.38	31,761	40.4	1.44
Totals, or average by class		181	100.0	378	2.09	78,672	100.0	1.18
Percent of all sales by class		30.4	--	--	--	2.1	--	--
1-4.9 million feet	1	66	33.5	66	1.00	146,612	31.5	1.00
	2	36	18.3	83	2.30	92,526	19.7	1.00
	3	95	48.2	342	3.60	228,964	48.8	1.81
Totals, or average by class		197	100.0	491	2.49	469,102	100.0	1.40
Percent of all sales by class		33.1	--	--	--	12.4	--	--
5-9.9 million feet	1	27	25.0	27	1.00	212,063	25.7	1.00
	2	27	25.0	70	2.59	215,590	26.1	1.00
	3	54	50.0	200	3.70	397,115	48.2	1.60
Totals, or average by class		108	100.0	297	2.75	824,768	100.0	1.29
Percent of all sales by class		18.2	--	--	--	21.8	--	--
10-14.9 million feet	1	12	36.4	12	1.00	150,600	36.1	1.00
	2	7	21.2	18	2.57	86,550	20.7	1.00
	3	14	42.4	53	3.78	180,440	43.2	1.52
Totals, or average by class		33	100.0	83	2.52	417,590	100.0	1.23
Percent of all sales by class		5.5	--	--	--	11.1	--	--
15 million feet or more	1	27	35.5	27	1.00	773,900	39.0	1.00
	2	29	38.2	72	2.48	773,422	38.9	1.00
	3	20	26.3	71	3.55	438,130	22.1	1.52
Totals, or average by class		76	100.0	170	2.24	1,985,452	100.0	1.11
Percent of all sales by class		12.8	--	--	--	52.6	--	--
Total or average, all sales		595		1,419	2.38	3,775,584		1.20

¹ The three competitive classes are defined as follows:

1. One bidder, bid-appraisal ratio = 1.00
2. Token bid (two or more bidders, bid-appraisal ratio = 1.00)
3. Two or more bidders, bid-appraisal ratio greater than 1.00 rounded to nearest 0.01.

Table 17.—Sale characteristics by bid-appraisal ratio class for all oral-auction National Forest timber sales, west side (excepting Shelton Working Circle), 1959-62

Bid-appraisal ratio class ¹	Number of sales	Percent of total sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Average volume per sale	Percent of total volume
					M bd. ft.	M bd. ft.	
1.00	751	32.1	1,437	1.91	3,109,467	4,140	27.3
1.01-1.10	247	10.6	823	3.33	1,198,356	4,852	10.5
1.11-1.20	173	7.4	700	4.05	829,595	4,795	7.3
1.21-1.30	193	8.3	858	4.45	885,565	4,588	7.8
1.31-1.40	162	6.9	787	4.86	773,869	4,777	6.8
1.41-1.50	162	6.9	966	5.96	1,003,050	6,192	8.8
1.51-1.60	126	5.4	715	5.67	594,398	4,717	5.2
1.61-1.70	118	5.0	758	6.42	643,355	5,452	5.7
1.71-1.80	84	3.6	583	6.94	400,677	4,770	3.5
1.81-1.90	68	2.9	422	6.21	373,804	5,497	3.3
1.91-2.00	43	1.8	273	6.35	182,360	4,241	1.6
Greater than 2.00	213	9.1	1,511	7.09	1,387,453	6,514	12.2
Total or average values	2,340	100.0	9,833	4.20	11,381,949	4,864	100.0

¹ Rounded to nearest 0.01.

Table 18.—Sale characteristics by bid-appraisal ratio classes for all oral-auction National Forest timber sales, east side, 1959-62

Bid-appraisal ratio class ¹	Number of sales	Percent of total sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Average volume per sale	Percent of total volume
					M bd. ft.	M bd. ft.	
1.00	341	57.3	513	1.50	2,499,174	7,329	66.2
1.01-1.10	71	11.9	191	2.69	355,832	5,012	9.4
1.11-1.20	35	5.9	99	2.83	149,259	4,265	4.0
1.21-1.30	26	4.4	87	3.35	99,207	3,816	2.6
1.31-1.40	22	3.7	88	4.00	117,733	5,352	3.1
1.41-1.50	9	1.5	29	3.22	34,745	3,861	.9
1.51-1.60	14	2.4	70	5.00	65,208	4,658	1.7
1.61-1.70	9	1.5	54	6.00	31,640	3,516	.8
1.71-1.80	12	2.0	49	4.08	65,976	5,498	1.8
1.81-1.90	4	.7	18	4.50	75,250	18,812	2.0
1.91-2.00	6	1.0	28	4.67	72,000	12,000	1.9
Greater than 2.00	46	7.7	193	4.20	209,560	4,556	5.6
Total or average values	595	100.0	1,419	2.38	3,775,584	6,346	100.0

¹ Rounded to nearest 0.01.

Table 19.—Sale characteristics by year and quarter for all National Forest timber sales, 1951-58, and for oral-auction sales only, 1959-62, west side (excepting Shelton Working Circle)

Year and quarter	Number of sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Weighted average bid-appraisal ratio	Year and quarter	Number of sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Weighted average bid-appraisal ratio
M bd. ft.						M bd. ft.					
1951	8					1957	45				
1st quarter	83			12,266	2.62	1st quarter	123			153,089	1.28
2nd quarter	62			508,265	1.64	2nd quarter	137			561,931	1.16
3rd quarter	83			307,692	1.39	3rd quarter	97			637,004	1.15
4th quarter	49			210,874	1.78	4th quarter				457,117	1.33
Total or average	202			1,039,097	1.61	Total or average	402			1,829,161	1.21
1952	50					1958	101				
1st quarter	84			388,870	1.08	1st quarter	254			397,491	1.29
2nd quarter	158			403,956	1.43	2nd quarter	168			1,269,699	1.85
3rd quarter	65			569,428	1.13	3rd quarter	90			1,027,384	2.02
4th quarter				273,877	1.76	4th quarter				517,115	1.52
Total or average	357			1,636,131	1.30	Total or average	613			3,211,689	1.78
1953	32					1959	78				
1st quarter	126			61,821	1.40	1st quarter	227			397,250	1.36
2nd quarter	92			362,423	1.29	2nd quarter	110			1,285,819	1.48
3rd quarter	71			382,860	1.17	3rd quarter	91			635,087	1.40
4th quarter				299,655	1.42	4th quarter				467,415	1.27
Total or average	321			1,106,759	1.29	Total or average	506			2,785,571	1.41
1954	39					1960	77				
1st quarter	140			108,146	1.44	1st quarter	287			299,106	1.32
2nd quarter	107			724,092	1.81	2nd quarter	110			1,272,773	1.33
3rd quarter	58			410,128	2.01	3rd quarter	124			681,454	1.47
4th quarter				202,449	2.21	4th quarter				555,010	1.20
Total or average	344			1,444,815	1.89	Total or average	596			2,808,343	1.34
1955	65					1961	72				
1st quarter	135			152,136	2.38	1st quarter	278			298,176	1.25
2nd quarter	122			656,123	2.14	2nd quarter	1051			1,249,359	1.53
3rd quarter	105			625,333	2.48	3rd quarter	132			612,150	1.46
4th quarter				384,879	1.63	4th quarter				691,620	1.35
Total or average	427			1,818,471	2.17	Total or average	592			2,851,305	1.44
1956	43					1962	72				
1st quarter	109			104,199	1.93	1st quarter	291			235,074	1.33
2nd quarter	173			430,098	1.36	2nd quarter	91			1,652,334	1.82
3rd quarter	98			977,470	1.45	3rd quarter	192			304,544	1.34
4th quarter				440,200	1.30	4th quarter				744,778	1.47
Total or average	423			1,951,967	1.42	Total or average	646			2,936,730	1.64

Table 20.—Sale characteristics by year and quarter for all National Forest timber sales, 1951-58, and oral-auction sales only, 1959-62, east side

Year and quarter	Number of sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Weighted average bid-appraisal ratio
M bd. ft.					
1951					
1st quarter	2			6,320	1.45
2nd quarter	31			299,173	1.23
3rd quarter	14			103,544	4.20
4th quarter	12			19,871	1.32
Total or average	59			428,908	1.95
1952					
1st quarter	1			2,900	1.00
2nd quarter	16			99,548	1.10
3rd quarter	32			232,068	1.11
4th quarter	19			81,771	1.20
Total or average	68			416,287	1.13
1953					
1st quarter	3			1,495	1.00
2nd quarter	29			221,340	1.04
3rd quarter	17			90,647	1.03
4th quarter	11			138,491	1.02
Total or average	60			451,973	1.03
1954					
1st quarter	7			6,670	1.08
2nd quarter	32			276,708	1.27
3rd quarter	29			174,603	1.29
4th quarter	19			168,227	1.04
Total or average	87			626,208	1.21
1955					
1st quarter	4			151,388	1.40
2nd quarter	31			258,732	1.34
3rd quarter	27			126,456	1.94
4th quarter	32			182,454	1.12
Total or average	94			719,030	1.40
1956					
1st quarter	7			26,503	1.09
2nd quarter	18			112,509	1.13
3rd quarter	26			301,217	1.09
4th quarter	18			90,202	1.01
Total or average	69			530,431	1.08

Year and quarter	Number of sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Weighted average bid-appraisal ratio
M bd. ft.					
1957					
1st quarter	4			56,450	1.01
2nd quarter	23			260,087	1.18
3rd quarter	27			261,402	1.58
4th quarter	18			77,679	1.03
Total or average	72			655,618	1.30
1958					
1st quarter	8			66,133	1.33
2nd quarter	32			262,526	1.36
3rd quarter	38			398,685	1.43
4th quarter	34			176,888	1.52
Total or average	112			904,232	1.42
1959					
1st quarter	18	50	2.78	182,000	1.06
2nd quarter	32	133	4.16	232,751	1.43
3rd quarter	30	64	2.13	154,013	1.18
4th quarter	32	68	2.12	251,785	1.16
Total or average	112	315	2.81	820,549	1.22
1960					
1st quarter	15	43	2.87	70,077	1.08
2nd quarter	51	136	2.67	306,598	1.05
3rd quarter	38	64	1.68	336,758	1.10
4th quarter	46	95	2.06	200,187	1.28
Total or average	150	338	2.25	913,620	1.12
1961					
1st quarter	18	38	2.11	112,139	1.59
2nd quarter	57	151	2.65	252,363	1.18
3rd quarter	34	80	2.35	178,057	1.43
4th quarter	34	72	2.12	307,244	1.16
Total or average	143	341	2.38	849,803	1.28
1962					
1st quarter	17	35	2.06	115,367	1.23
2nd quarter	68	171	2.51	662,465	1.21
3rd quarter	30	67	2.23	122,280	1.15
4th quarter	75	152	2.03	291,500	1.17
Total or average	190	425	2.24	1,191,612	1.20

Table 21.—Competitive characteristics by year for all National Forest timber sales, 1951-58, and oral-auction sales only, 1959-62, west side (excepting Shelton Working Circle)

Year	Competitive class	Number of sales	Percent of year sales	Total number of bidders	Average number of bidders	Total volume sold	Average volume per sale	Percent of year volume	Weighted average bid-appraisal ratio
						M bd. ft.	M bd. ft.		
1951	Noncompetitive sales	74	36.6	--	--	303,465	4,101	29.2	1.00
	Competitive sales	128	63.4	--	--	735,632	5,747	70.8	1.86
	Total	202	100.0	--	--	1,039,097	5,144	100.0	1.61
1952	Noncompetitive sales	147	41.2	--	--	840,790	5,720	51.4	1.00
	Competitive sales	210	58.8	--	--	795,341	3,787	48.6	1.61
	Total	357	100.0	--	--	1,636,131	4,583	100.0	1.30
1953	Noncompetitive sales	129	40.2	--	--	632,820	4,906	57.2	1.00
	Competitive sales	192	59.8	--	--	473,939	2,468	42.8	1.68
	Total	321	100.0	--	--	1,106,759	3,448	100.0	1.29
1954	Noncompetitive sales	65	18.9	--	--	387,408	5,960	26.8	1.00
	Competitive sales	279	81.1	--	--	1,057,407	3,790	73.2	2.22
	Total	344	100.0	--	--	1,444,815	4,200	100.0	1.89
1955	Noncompetitive sales	49	11.5	--	--	46,536	950	2.6	1.00
	Competitive sales	378	88.5	--	--	1,771,935	4,688	97.4	2.20
	Total	427	100.0	--	--	1,818,471	4,259	100.0	2.16
1956	Noncompetitive sales	131	31.0	--	--	494,851	3,777	25.4	1.00
	Competitive sales	292	69.0	--	--	1,457,116	4,990	74.6	1.57
	Total	423	100.0	--	--	1,951,967	4,614	100.0	1.42
1957	Noncompetitive sales	153	38.1	--	--	885,692	5,789	48.4	1.00
	Competitive sales	249	61.9	--	--	943,469	3,789	51.6	1.41
	Total	402	100.0	--	--	1,829,161	4,550	100.0	1.21
1958	Noncompetitive sales	115	18.8	--	--	667,142	5,801	20.8	1.00
	Competitive sales	498	81.2	--	--	2,544,547	5,110	79.2	1.98
	Total	613	100.0	--	--	3,211,689	5,239	100.0	1.78
1959	Noncompetitive sales	117	23.1	220	1.88	496,167	4,241	17.8	1.00
	Competitive sales	389	76.9	2,390	6.14	2,289,404	5,885	82.2	1.50
	Total	506	100.0	2,610	5.16	2,785,571	5,505	100.0	1.41
1960	Noncompetitive sales	217	36.4	390	1.80	810,092	3,733	28.8	1.00
	Competitive sales	379	63.6	1,874	4.94	1,998,251	5,272	71.2	1.47
	Total	596	100.0	2,264	3.80	2,808,343	4,712	100.0	1.34
1961	Noncompetitive sales	222	37.5	398	1.79	958,732	4,319	33.6	1.00
	Competitive sales	370	62.5	1,783	4.82	1,892,573	5,115	66.4	1.67
	Total	592	100.0	2,181	3.68	2,851,305	4,816	100.0	1.44
1962	Noncompetitive sales	197	30.5	443	2.25	857,276	4,352	29.2	1.00
	Competitive sales	449	69.5	2,335	5.20	2,079,454	4,631	70.8	1.91
	Total	646	100.0	2,778	4.30	2,936,730	4,546	100.0	1.64

Table 22.—Competitive characteristics by year for all National Forest timber sales, 1951-58, and oral-auction sales only, 1959-62, east side

Year	Competitive class	Number of sales	Percent of year sales	Total number of bidders	Average number of bidders	Total volume sold	Average volume per sale	Percent of year volume	Weighted average bid-appraisal ratio
						M bd. ft.	M bd. ft.		
1951	Noncompetitive sales	34	57.6	--	--	150,862	4,437	35.2	1.00
	Competitive sales	25	42.4	--	--	278,046	11,122	64.8	2.47
	Total	59	100.0	--	--	428,908	7,270	100.0	1.95
1952	Noncompetitive sales	39	57.4	--	--	266,967	6,845	64.1	1.00
	Competitive sales	29	42.6	--	--	149,320	5,149	35.9	1.35
	Total	68	100.0	--	--	416,287	6,122	100.0	1.13
1953	Noncompetitive sales	43	71.7	--	--	404,666	9,411	89.5	1.00
	Competitive sales	17	28.3	--	--	47,307	2,783	10.5	1.28
	Total	60	100.0	--	--	451,973	7,533	100.0	1.03
1954	Noncompetitive sales	40	46.0	--	--	434,654	10,866	69.4	1.00
	Competitive sales	47	54.0	--	--	191,554	4,076	30.6	1.69
	Total	87	100.0	--	--	626,208	7,198	100.0	1.21
1955	Noncompetitive sales	39	41.5	--	--	363,227	9,314	50.0	1.00
	Competitive sales	55	58.5	--	--	355,803	6,469	49.5	1.82
	Total	94	100.0	--	--	719,030	7,649	100.0	1.40
1956	Noncompetitive sales	45	65.2	--	--	395,812	8,796	74.6	1.00
	Competitive sales	24	34.8	--	--	134,619	5,609	25.4	1.33
	Total	69	100.0	--	--	530,431	7,687	100.0	1.08
1957	Noncompetitive sales	42	58.3	--	--	351,962	8,380	53.7	1.00
	Competitive sales	30	41.7	--	--	303,656	10,122	46.3	1.66
	Total	72	100.0	--	--	655,618	9,106	100.0	1.31
1958	Noncompetitive sales	60	53.6	--	--	504,871	8,414	55.8	1.00
	Competitive sales	52	46.4	--	--	399,361	7,680	44.2	1.95
	Total	112	100.0	--	--	904,232	8,074	100.0	1.42
1959	Noncompetitive sales	63	56.2	113	1.79	562,519	8,929	68.6	1.00
	Competitive sales	49	43.8	202	4.12	258,030	5,266	31.4	1.70
	Total	112	100.0	315	2.81	820,549	7,326	100.0	1.22
1960	Noncompetitive sales	96	64.0	142	1.48	666,671	6,944	73.0	1.00
	Competitive sales	54	36.0	196	3.63	246,949	4,573	27.0	1.44
	Total	150	100.0	338	2.25	913,620	6,091	100.0	1.12
1961	Noncompetitive sales	84	58.7	117	1.39	524,799	6,248	61.8	1.00
	Competitive sales	59	41.3	224	3.80	325,004	5,509	38.2	1.74
	Total	143	100.0	341	2.38	849,803	5,943	100.0	1.28
1962	Noncompetitive sales	98	51.6	141	1.44	745,185	7,604	62.5	1.00
	Competitive sales	92	48.4	284	3.09	446,427	4,852	37.5	1.52
	Total	190	100.0	425	2.24	1,191,612	6,272	100.0	1.20

APPENDIX B

Tables of Bureau of Land Management Sales Data

Table 23.—Sale data by Bureau of Land Management master unit, total west side, 1951-62

Kind of sale and master unit	Number of sales	Average number of bidders per sale	Volume	Percent of total volume sold	Average sale size	Weighted average appraised price	Weighted average bid-appraisal ratio
			M. bd. ft.		M. bd. ft.	Dollars	
One-bidder sales:							
Alsea-Rickreall	80	1.00	175,888	27.6	2,199	19.72	1.00
Clackamas-Molalla	21	1.00	23,966	11.4	1,141	17.01	1.00
Columbia	50	1.00	102,818	24.8	2,056	20.03	1.00
Douglas	179	1.00	497,129	43.5	2,777	21.07	1.00
Jackson	56	1.00	112,869	21.6	2,016	20.15	1.01
Josephine	121	1.00	342,471	45.1	2,830	21.18	1.00
Klamath	13	1.00	23,691	16.2	1,822	21.20	1.00
Santiam	46	1.00	164,032	28.2	3,566	19.70	1.00
Siuslaw	84	1.00	141,108	16.3	1,680	21.71	1.00
South Coast	133	1.00	458,143	31.5	3,445	20.10	1.01
South Umpqua	52	1.00	115,644	44.8	2,224	19.32	1.00
Upper Willamette	64	1.00	113,548	18.5	1,774	23.90	1.00
All master units — west side	899	1.00	2,271,307	29.9	2,526	20.64	1.00
Token bid sales:							
Alsea-Rickreall	1	1.00	1,726	0.3	1,726	18.91	1.00
Clackamas-Molalla	0	0	0	0	0	0	0
Columbia	3	1.67	15,505	3.7	5,168	19.34	1.00
Douglas	1	2.00	3,230	0.3	3,230	18.46	1.00
Jackson	2	2.00	3,945	0.8	1,972	22.44	1.00
Josephine	3	2.00	977	0.1	326	21.39	1.00
Klamath	1	2.00	2,134	1.5	2,134	28.00	1.00
Santiam	0	0	0	0	0	0	0
Siuslaw	1	2.00	2,289	0.2	2,289	30.63	1.00
South Coast	2	2.00	7,985	0.6	3,992	24.42	1.00
South Umpqua	0	0	0	0	0	0	0
Upper Willamette	2	2.00	160	0.0	80	15.44	1.00
All master units — west side	16	1.88	37,951	0.5	2,372	21.84	1.00
Competitive sales:							
Alsea-Rickreall	177	2.72	458,954	72.1	2,593	22.27	1.59
Clackamas-Molalla	67	2.97	186,020	88.6	2,776	17.47	1.64
Columbia	136	3.03	296,585	71.5	2,181	20.15	1.52
Douglas	303	2.71	642,865	56.2	2,122	21.46	1.45
Jackson	136	3.12	405,558	77.6	2,982	21.38	1.38
Josephine	160	3.07	415,497	54.8	2,597	23.24	1.39
Klamath	43	3.30	120,243	82.3	2,796	20.92	1.36
Santiam	146	2.84	417,040	71.8	2,856	21.62	1.41
Siuslaw	383	3.19	724,156	83.5	1,891	23.15	1.60
South Coast	254	2.76	986,474	67.9	3,884	21.96	1.37
South Umpqua	53	2.92	142,228	55.2	2,684	20.36	1.39
Upper Willamette	237	3.04	500,453	81.5	2,112	24.10	1.52
All master units — west side	2,095	2.95	5,296,073	69.6	2,528	21.99	1.47
All sales:							
Alsea-Rickreall	258	2.18	636,568	100.0	2,467	21.56	1.44
Clackamas-Molalla	88	2.50	209,986	100.0	2,386	17.41	1.57
Columbia	189	2.47	414,908	100.0	2,195	20.09	1.37
Douglas	483	2.07	1,143,224	100.0	2,367	21.28	1.26
Jackson	194	2.49	522,372	100.0	2,693	21.12	1.30
Josephine	284	2.18	758,945	100.0	2,672	22.31	1.22
Klamath	57	2.75	146,068	100.0	2,563	21.07	1.30
Santiam	192	2.40	581,072	100.0	3,026	21.08	1.31
Siuslaw	468	2.79	867,553	100.0	1,854	22.94	1.51
South Coast	389	2.15	1,452,602	100.0	3,734	21.38	1.26
South Umpqua	105	1.97	257,872	100.0	2,456	19.90	1.22
Upper Willamette	303	2.60	614,161	100.0	2,027	24.06	1.43
All master units — west side	3,010	2.36	7,605,331	100.0	2,527	21.59	1.33

Table 24.—Sale characteristics by volume size classes for all oral-auction Bureau of Land Management timber sales, west side, 1951-62

Volume size class	Competitive class ¹	Number of sales	Percent of sales in competitive class	Total number of bidders	Average number of bidders	Total volume sold	Percent size class	Weighted average bid-appraisal ratio av. = WBR/vol.
M bd. ft.								
Less than 1 million feet	1	363	34.4	363	1.00	117,321	27.8	1.01
	2	7	0.7	14	2.00	1,933	0.5	1.00
	3	684	64.9	2,027	2.96	302,711	71.7	1.50
Totals or average by class		1,054	100.0	2,404	2.28	421,965	100.0	1.37
Percent of all sales by class		35.0	--	--	--	5.6	--	--
1-4.9 million feet	1	387	25.5	387	1.00	1,028,629	26.2	1.00
	2	7	0.5	12	1.71	18,774	0.5	1.00
	3	1,122	74.0	3,354	2.99	2,879,023	73.3	1.48
Totals or average by class		1,516	100.0	3,753	2.48	3,926,426	100.0	1.36
Percent of all sales by class		50.4	--	--	--	51.6	--	--
5-9.9 million feet	1	133	33.4	133	1.00	912,678	33.4	1.00
	2	1	0.3	2	2.00	5,315	0.2	1.00
	3	264	66.3	736	2.79	1,815,378	66.4	1.47
Totals or average by class		398	100.0	871	2.19	2,733,371	100.0	1.31
Percent of all sales by class		13.2	--	--	--	35.9	--	--
10-14.9 million feet	1	13	34.2	13	1.00	156,173	34.7	1.02
	2	1	2.6	2	2.00	11,929	2.7	1.00
	3	24	63.2	60	2.50	281,591	62.6	1.38
Totals or average by class		38	100.0	75	1.97	449,693	100.0	1.24
Percent of all sales by class		1.3	--	--	--	5.9	--	--
15 million feet or more	1	3	75.0	3	1.00	56,506	76.5	1.00
	2	0	0	0	0	0	0	0
	3	1	25.0	5	5.00	17,370	23.5	1.13
Totals or average by class		4	100.0	8	2.00	73,876	100.0	1.04
Percent of all sales by class		0.1	--	--	--	1.0	--	--
Total or average, all sales		3,010	100.0	7,111	2.36	7,605,331	100.0	1.33

¹ The three competitive classes are defined as follows:

1. One bidder, bid-appraisal ratio = 1.00
2. Token bid (two or more bidders, bid-appraisal ratio = 1.00)
3. Two or more bidders, bid-appraisal ratio greater than 1.00 rounded to nearest 0.01.

Table 25.—Sale characteristics by volume size classes for all oral-auction Bureau of Land Management timber sales, east side, 1951-62

Volume size class	Competitive class ¹	Number of sales	Percent of sales in competitive class	Total number of bidders	Average number of bidders	Total volume sold	Percent size class	Weighted average bid-appraisal ratio av. = WBR/vol.
<u>M bd. ft.</u>								
Less than 1 million feet	1	53	61.6	53	1.00	23,150	62.19	1.00
	2	1	1.2	2	2.00	475	1.28	1.00
	3	32	37.2	76	2.38	13,600	36.53	1.29
Totals or average by class		86	100.0	131	1.52	37,225	100.00	1.12
Percent of all sales by class		57.7	--	--	--	22.0	--	--
1-4.9 million feet	1	38	61.3	38	1.00	76,486	60.93	1.00
	2	1	1.6	2	2.00	1,647	1.31	1.00
	3	23	37.1	59	2.57	47,397	37.76	1.32
Totals or average by class		62	100.0	99	1.60	125,530	100.00	1.12
Percent of all sales by class		41.6	--	--	--	74.1	--	--
5-9.9 million feet	1	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0
	3	1	100.0	5	5.00	6,695	100.00	1.73
Totals or average by class		1	100.0	5	5.00	6,695	100.00	1.73
Percent of all sales by class		0.7	--	--	--	3.9	--	--
10-14.9 million feet	1	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0
Totals or average by class		0	0	0	0	0	0	0
Percent of all sales by class								
15 million feet or more	1	0	0	0	0	0	0	0
	2	0	0	0	0	0	0	0
	3	0	0	0	0	0	0	0
Totals or average by class		0	0	0	0	0	0	0
Percent of all sales by class								
Total or average, all sales		149	100.0	235	1.58	169,450	100.00	1.16

¹ The three competitive classes are defined as follows:

1. One bidder, bid-appraisal ratio = 1.00
2. Taken bid (two or more bidders, bid-appraisal ratio = 1.00)
3. Two or more bidders, bid-appraisal ratio greater than 1.00 rounded to nearest 0.01.

Table 26.—Sale characteristics by bid-appraisal ratio classes for all oral-auction Bureau of Land Management timber sales, west side, 1951-62

Bid-appraisal ratio class ¹	Number of sales	Percent of total sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Average volume per sale	Percent of total volume
					M bd. ft.	M bd. ft.	
1.00	913	30.3	950	1.04	2,327,759	2,550	30.6
1.01-1.10	258	8.6	539	2.09	715,845	2,775	9.4
1.11-1.20	239	7.9	574	2.40	615,683	2,576	8.1
1.21-1.30	254	8.4	696	2.74	700,563	2,758	9.2
1.31-1.40	241	8.0	692	2.87	559,500	2,322	7.4
1.41-1.50	217	7.2	657	3.03	545,913	2,516	7.2
1.51-1.60	213	7.1	650	3.05	533,344	2,504	7.0
1.61-1.70	161	5.3	511	3.17	370,383	2,301	4.9
1.71-1.80	127	4.2	431	3.39	299,987	2,362	3.9
1.81-1.90	92	3.1	318	3.46	251,580	2,735	3.3
1.91-2.00	69	2.3	240	3.48	180,956	2,623	2.4
Greater than 2.00	226	7.5	853	3.77	503,818	2,229	6.6
Total or average values	3,010	100.0	7,111	2.36	7,605,331	2,527	100.0

¹ Rounded to nearest 0.01.

Table 27.—Sale characteristics by bid-appraisal ratio classes for all oral-auction Bureau of Land Management timber sales, east side, 1951-62

Bid-appraisal ratio class ¹	Number of sales	Percent of total sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Average volume per sale	Percent of total volume
					M bd. ft.	M bd. ft.	
1.00	94	63.2	101	1.07	102,346	1,089	60.4
1.01-1.10	15	10.1	26	1.73	13,793	920	8.2
1.11-1.20	6	4.0	13	2.17	5,253	876	3.1
1.21-1.30	10	6.7	23	2.30	16,145	1,614	9.5
1.31-1.40	6	4.0	20	3.33	4,586	764	2.7
1.41-1.50	2	1.3	5	2.50	3,377	1,688	2.0
1.51-1.60	3	2.0	8	2.67	2,258	753	1.3
1.61-1.70	2	1.3	5	2.50	393	196	0.2
1.71-1.80	1	0.7	5	5.00	6,695	6,695	4.0
1.81-1.90	0	0	0	0	0	0	0
1.91-2.00	2	1.3	5	2.50	2,922	1,461	1.7
Greater than 2.00	8	5.4	24	3.00	11,682	1,460	6.9
Total or average values	149	100.0	235	1.58	169,450	1,137	100.0

¹ Rounded to nearest 0.01.

Table 28.—Sale characteristics by year and quarter, for all oral-auction Bureau of Land Management timber sales, west side, 1951-62

Year and quarter	Number of sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Weighted average bid-appraisal ratio	M bd. ft.					
						1951					
1st quarter	18	30	1.67	39,611	1.15	1957					
2nd quarter	46	85	1.85	142,375	1.08	1st quarter	43	93	2.16	77,079	1.26
3rd quarter	19	29	1.53	59,474	1.40	2nd quarter	99	197	1.99	318,944	1.16
4th quarter	24	47	1.96	82,530	1.20	3rd quarter	54	124	2.30	78,766	1.19
Total or average	107	191	1.79	323,990	1.18	4th quarter	49	102	2.08	155,535	1.18
						Total or average	245	516	2.11	630,324	1.18
						1952					
1st quarter	22	31	1.41	32,789	1.04	1958					
2nd quarter	37	54	1.46	104,866	1.16	1st quarter	60	149	2.48	147,992	1.17
3rd quarter	37	63	1.70	125,054	1.14	2nd quarter	100	229	2.29	309,370	1.20
4th quarter	18	45	2.50	61,750	1.24	3rd quarter	67	171	2.55	160,325	1.37
Total or average	114	193	1.69	324,459	1.15	4th quarter	62	161	2.60	200,896	1.39
						Total or average	289	710	2.46	818,583	1.27
						1953					
1st quarter	22	48	2.18	54,140	1.11	1959					
2nd quarter	40	80	2.00	109,625	1.22	1st quarter	55	174	3.16	134,389	1.60
3rd quarter	47	67	1.43	61,335	1.14	2nd quarter	131	381	2.91	365,169	1.56
4th quarter	48	114	2.38	118,047	1.14	3rd quarter	71	188	2.65	210,991	1.31
Total or average	157	309	1.97	343,147	1.17	4th quarter	66	177	2.68	174,951	1.24
						Total or average	323	920	2.85	885,500	1.43
						1954					
1st quarter	53	159	3.00	96,062	1.35	1960					
2nd quarter	81	183	2.26	192,121	1.33	1st quarter	61	160	2.62	152,791	1.49
3rd quarter	58	166	2.86	94,064	1.64	2nd quarter	160	396	2.47	467,531	1.49
4th quarter	62	192	3.10	150,923	1.58	3rd quarter	87	214	2.46	166,933	1.46
Total or average	254	700	2.76	533,170	1.46	4th quarter	59	132	2.24	218,195	1.28
						Total or average	367	902	2.46	1,005,450	1.44
						1955					
1st quarter	45	159	3.53	72,844	1.69	1961					
2nd quarter	62	202	3.26	111,616	2.03	1st quarter	42	114	2.71	105,742	1.37
3rd quarter	38	113	2.97	91,170	1.86	2nd quarter	150	305	2.03	390,667	1.33
4th quarter	51	157	3.08	174,240	1.54	3rd quarter	97	180	1.86	180,676	1.27
Total or average	196	631	3.22	449,870	1.72	4th quarter	70	130	1.86	204,666	1.26
						Total or average	359	729	2.03	881,751	1.31
						1956					
1st quarter	47	152	3.23	94,128	1.51	1962					
2nd quarter	112	263	2.35	246,743	1.27	1st quarter	65	145	2.23	179,308	1.37
3rd quarter	53	116	2.19	105,779	1.18	2nd quarter	131	249	1.90	335,252	1.25
4th quarter	31	67	2.16	72,098	1.11	3rd quarter	101	195	1.93	212,740	1.29
Total or average	243	598	2.46	518,748	1.27	4th quarter	59	123	2.08	163,039	1.16
						Total or average	356	712	2.00	890,339	1.27

Table 29.—Sale characteristics by year and quarter for all oral-auction Bureau of Land Management timber sales, east side, 1951-62

Year and quarter	Number of sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Weighted average bid-appraisal ratio	Year and quarter	Number of sales	Total number of bidders	Average number of bidders per sale	Total volume sold	Weighted average bid-appraisal ratio
M. bd. ft.						M. bd. ft.					
1951						1957					
1st quarter	0	0	0	0	0	1st quarter	0	0	0	0	0
2nd quarter	1	5	5.00	6,695	1.73	2nd quarter	13	17	1.31	15,620	1.03
3rd quarter	1	1	1.00	2,060	1.00	3rd quarter	1	1	1.00	321	1.00
4th quarter	0	0	0	0	0	4th quarter	2	2	1.00	818	1.00
Total or average	2	6	3.00	8,755	1.48	Total or average	16	20	1.25	16,759	1.03
1952						1958					
1st quarter	1	1	1.00	3,217	1.30	1st quarter	6	8	1.33	8,944	1.01
2nd quarter	0	0	0	0	0	2nd quarter	11	19	1.73	13,631	1.32
3rd quarter	0	0	0	0	0	3rd quarter	0	0	0	0	0
4th quarter	0	0	0	0	0	4th quarter	0	0	0	0	0
Total or average	1	1	1.00	3,217	1.30	Total or average	17	27	1.59	22,575	1.18
1953						1959					
1st quarter	4	4	1.00	2,686	1.01	1st quarter	0	0	0	0	0
2nd quarter	0	0	0	0	0	2nd quarter	23	40	1.74	26,832	1.17
3rd quarter	2	3	1.50	2,238	1.08	3rd quarter	1	1	1.00	1,065	1.00
4th quarter	3	3	1.00	4,003	1.00	4th quarter	0	0	0	0	0
Total or average	9	10	1.11	8,927	1.01	Total or average	24	41	1.71	27,897	1.16
1954						1960					
1st quarter	0	0	0	0	0	1st quarter	1	3	3.00	2,561	2.03
2nd quarter	1	1	1.00	460	1.00	2nd quarter	11	17	1.55	18,917	1.02
3rd quarter	3	5	1.67	1,945	1.48	3rd quarter	1	1	1.00	83	1.00
4th quarter	2	2	1.00	2,100	1.00	4th quarter	1	2	2.00	223	1.13
Total or average	6	8	1.33	4,505	1.29	Total or average	14	23	1.64	21,784	1.07
1955						1961					
1st quarter	3	3	1.00	3,717	1.00	1st quarter	0	0	0	0	0
2nd quarter	7	12	1.71	10,570	1.28	2nd quarter	16	20	1.25	11,288	1.05
3rd quarter	2	4	2.00	551	1.20	3rd quarter	1	2	2.00	544	1.23
4th quarter	4	11	2.75	1,814	1.10	4th quarter	2	3	1.50	565	1.01
Total or average	16	30	1.88	16,652	1.21	Total or average	19	25	1.32	12,397	1.06
1956						1962					
1st quarter	4	5	1.25	3,919	1.04	1st quarter	1	1	1.00	401	1.00
2nd quarter	8	16	2.00	9,567	1.14	2nd quarter	5	7	1.40	4,949	1.12
3rd quarter	3	9	3.00	3,473	1.24	3rd quarter	1	3	3.00	510	1.56
4th quarter	1	1	1.00	2,729	1.00	4th quarter	2	2	1.00	434	1.01
Total or average	16	31	1.94	19,688	1.13	Total or average	9	13	1.44	6,294	1.15

Table 30.—Competitive characteristics by year for all oral-auction Bureau of Land Management timber sales, west side, 1951-62

Year	Competitive class	Number of sales	Percent of year sales	Total number of bidders	Average number of bidders	Total volume sold	Average volume per sale	Percent of year volume	Weighted average bid-appraisal ratio
						M bd. ft.	M bd. ft.		
1951	Noncompetitive sales	57	53.3	57	1.00	191,279	3,355.77	59.0	1.00
	Competitive sales	50	46.7	134	2.68	132,711	2,654.22	41.0	1.43
	Total	107	100.0	191	1.79	323,990	3,027.94	100.0	1.18
1952	Noncompetitive sales	67	58.8	69	1.03	205,638	3,069.22	63.4	1.00
	Competitive sales	47	41.2	124	2.64	118,821	2,528.11	36.6	1.39
	Total	114	100.0	193	1.69	324,459	2,846.13	100.0	1.15
1953	Noncompetitive sales	74	47.1	74	1.00	192,139	2,596.47	56.0	1.00
	Competitive sales	83	52.9	235	2.83	151,008	1,819.37	44.0	1.35
	Total	157	100.0	309	1.97	343,147	2,185.65	100.0	1.17
1954	Noncompetitive sales	58	22.8	59	1.02	138,572	2,389.17	26.0	1.00
	Competitive sales	196	77.2	641	3.27	394,598	2,013.26	74.0	1.62
	Total	254	100.0	700	2.76	533,170	2,099.09	100.0	1.46
1955	Noncompetitive sales	24	12.2	24	1.00	34,667	1,444.46	7.7	1.01
	Competitive sales	172	87.8	607	3.53	415,203	2,413.97	92.3	1.78
	Total	196	100.0	631	3.22	449,870	2,295.26	100.0	1.72
1956	Noncompetitive sales	60	24.7	61	1.02	121,347	2,022.45	23.4	1.00
	Competitive sales	183	75.3	537	2.93	397,401	2,171.59	76.6	1.36
	Total	243	100.0	598	2.46	518,748	2,134.77	100.0	1.27
1957	Noncompetitive sales	91	37.1	92	1.01	209,120	2,298.02	33.2	1.00
	Competitive sales	154	62.9	424	2.75	421,204	2,735.09	66.8	1.27
	Total	245	100.0	516	2.11	630,324	2,572.75	100.0	1.18
1958	Noncompetitive sales	78	27.0	80	1.03	227,371	2,915.01	27.8	1.00
	Competitive sales	211	73.0	630	2.99	591,212	2,801.95	72.2	1.38
	Total	289	100.0	710	2.46	818,583	2,832.47	100.0	1.27
1959	Noncompetitive sales	48	14.9	49	1.02	116,141	2,419.60	13.1	1.03
	Competitive sales	275	85.1	871	3.17	769,359	2,797.67	86.9	1.49
	Total	323	100.0	920	2.85	885,500	2,741.49	100.0	1.43
1960	Noncompetitive sales	81	22.1	81	1.00	187,340	2,312.84	18.6	1.00
	Competitive sales	286	77.9	821	2.87	818,110	2,860.52	81.4	1.53
	Total	367	100.0	902	2.46	1,005,450	2,739.65	100.0	1.44
1961	Noncompetitive sales	133	37.0	138	1.04	303,263	2,280.17	34.4	1.00
	Competitive sales	226	63.0	591	2.62	578,488	2,559.68	65.6	1.46
	Total	359	100.0	729	2.03	881,751	2,456.13	100.0	1.31
1962	Noncompetitive sales	144	40.4	145	1.01	382,381	2,655.42	43.0	1.00
	Competitive sales	212	59.6	567	2.67	507,958	2,396.03	57.0	1.47
	Total	356	100.0	712	2.00	890,339	2,500.95	100.0	1.27

Table 31.—Competitive characteristics by year for all oral-auction Bureau of Land Management timber sales, east side, 1951-62

Year	Competitive class	Number of sales	Percent of year sales	Total number of bidders	Average number of bidders	Total volume sold	Average volume per sale	Percent of year volume	Weighted average bid-appraisal ratio
						M bd. ft.	M bd. ft.		
1951	Noncompetitive sales	1	50.0	1	1.00	2,060	2,060.00	23.5	1.00
	Competitive sales	1	50.0	5	5.00	6,695	6,695.00	76.5	1.73
	Total	2	100.0	6	3.00	8,755	4,377.50	100.0	1.48
1952	Noncompetitive sales	1	100.0	1	1.00	3,217	3,217.00	100.0	1.30
	Competitive sales	0	0	0	0	0	0	0	0
	Total	1	100.0	1	1.00	3,217	3,217.00	100.0	1.30
1953	Noncompetitive sales	8	88.9	8	1.00	7,047	880.88	78.9	1.00
	Competitive sales	1	11.1	2	2.00	1,880	1,880.00	21.1	1.16
	Total	9	100.0	10	1.11	8,927	991.89	100.0	1.01
1954	Noncompetitive sales	4	66.7	4	1.00	2,964	741.00	65.8	1.00
	Competitive sales	2	33.3	4	2.00	1,541	770.50	34.2	1.71
	Total	6	100.0	8	1.33	4,505	750.83	100.0	1.29
1955	Noncompetitive sales	8	50.0	8	1.00	6,202	775.25	37.2	1.00
	Competitive sales	8	50.0	22	2.75	10,450	1,306.25	62.8	1.31
	Total	16	100.0	30	1.88	16,652	1,040.75	100.0	1.21
1956	Noncompetitive sales	8	50.0	8	1.00	12,126	1,515.75	61.6	1.00
	Competitive sales	8	50.0	23	2.88	7,562	945.25	38.4	1.34
	Total	16	100.0	31	1.94	19,688	1,230.50	100.0	1.13
1957	Noncompetitive sales	12	75.0	12	1.00	10,265	855.42	61.2	1.00
	Competitive sales	4	25.0	8	2.00	6,494	1,623.50	38.8	1.06
	Total	16	100.0	20	1.25	16,759	1,047.44	100.0	1.03
1958	Noncompetitive sales	10	58.8	10	1.00	17,088	1,708.80	75.7	1.00
	Competitive sales	7	41.2	17	2.43	5,487	783.86	24.3	1.61
	Total	16	100.0	27	1.59	22,575	1,327.94	100.0	1.18
1959	Noncompetitive sales	15	62.5	16	1.07	14,628	975.20	52.4	1.00
	Competitive sales	9	37.5	25	2.78	13,269	1,474.33	47.6	1.39
	Total	24	100.0	41	1.71	27,897	1,162.38	100.0	1.16
1960	Noncompetitive sales	8	57.1	9	1.13	12,357	1,544.63	56.7	1.00
	Competitive sales	6	42.9	14	2.33	9,427	1,571.17	43.3	1.20
	Total	14	100.0	23	1.64	21,784	1,556.00	100.0	1.07
1961	Noncompetitive sales	12	63.2	12	1.00	9,023	751.92	72.8	1.00
	Competitive sales	7	36.8	13	1.86	3,374	482.00	27.2	1.21
	Total	19	100.0	25	1.32	12,397	652.47	100.0	1.06
1962	Noncompetitive sales	6	66.7	6	1.00	4,781	796.83	76.0	1.00
	Competitive sales	3	33.3	7	2.33	1,513	504.33	24.0	1.47
	Total	9	100.0	13	1.44	6,294	699.33	100.0	1.15

APPENDIX C

Firms Classed as Large on the West Side

- | | |
|--|------------------------------------|
| 1. U. S. Plywood Corporation | 19. West Coast Plywood Co. |
| 2. Clemens Forest Products, Inc. | 20. Santiam Lumber Company |
| 3. Cascades Plywood Corporation | 21. Georgia-Pacific Corp. |
| 4. Willamette Valley Lumber Co. | 22. Coos Head Timber Company |
| 5. Diamond Lumber Company | 23. Steve Wilson Co. |
| 6. Weyerhaeuser Company | 24. Evans Products Company |
| 7. Edward Hines Lumber Co. | 25. St. Regis Paper Co. |
| 8. Simpson Timber Co. | 26. International Paper Company |
| 9. Rayonier Incorporated | 27. Crown Zellerbach Corp. |
| 10. Stomar Lumber Co. | 28. Olson Lumber, Inc. |
| 11. Roseburg Lumber Co. | 29. Rainier Manufacturing Co. |
| 12. Pope and Talbot, Inc. | 30. Puget Sound Plywood, Inc. |
| 13. Medford Corporation | 31. Eugene Plywood Co. |
| 14. Timber Products Company | 32. Fort Vancouver Plywood Co. |
| 15. Scott Paper Company | 33. Hub City Plywood Corp. |
| 16. Everett Plywood & Door Corporation | 34. Jones Veneer & Plywood Company |
| 17. Mountain Fir Lumber Co. | 35. Longview Fibre Company |
| 18. Coquille Valley Lumber Co. | 36. Plywood Products Corp. |
| | 37. Lane Plywood, Inc. |

Firms Classed as Large on the East Side

1. Biles Coleman Lumber Co.
2. Weyerhaeuser Company
3. Edward Hines Lumber Co.
4. Boise Cascade Corporation
5. Brooks-Scanlon, Inc.
6. Kinzua Corporation
7. Ellingson Lumber Co.
8. J. Herbert Bate Co.

Mead, Walter J., and Hamilton, Thomas E.

1968. Competition for Federal timber in the Pacific Northwest — an analysis of Forest Service and Bureau of Land Management timber sales. U. S. D. A. Forest Serv. Res. Pap. PNW-64, 63 pp., illus. Pacific Northwest Forest & Range Exp. Sta., Portland, Oregon.

Forest Service and Bureau of Land Management timber sales in Oregon and Washington showed that competition, defined as the ratio between bid price and appraised price, was significantly affected by number of bidders, size of purchaser, sale size and road construction requirements, and the size of the average appraised price. Lumber prices and the level of housing starts were found to be important in explaining the size of the bid-appraisal ratio.

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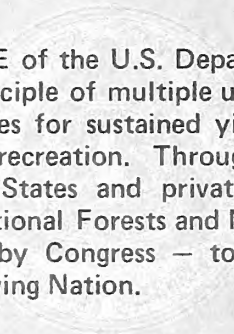
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Headquarters for the PACIFIC NORTHWEST FOREST AND RANGE EXPERIMENT STATION is in Portland, Oregon. The Station's mission is to provide the scientific knowledge, technology, and alternatives for management, use, and protection of forest, range, and related environments for present and future generations. The area of research encompasses Alaska, Washington, and Oregon, with some projects including California, Hawaii, the Western States, or the Nation. Project headquarters are at:

College, Alaska
Juneau, Alaska
Bend, Oregon
Corvallis, Oregon
La Grande, Oregon

Portland, Oregon
Roseburg, Oregon
Olympia, Washington
Seattle, Washington
Wenatchee, Washington



The FOREST SERVICE of the U.S. Department of Agriculture is dedicated to the principle of multiple use management of the Nation's forest resources for sustained yields of wood, water, forage, wildlife, and recreation. Through forestry research, cooperation with the States and private forest owners, and management of the National Forests and National Grasslands, it strives — as directed by Congress — to provide increasingly greater service to a growing Nation.